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THE EVOLUTION OF BOGOSLOF VOLCANO.

BY

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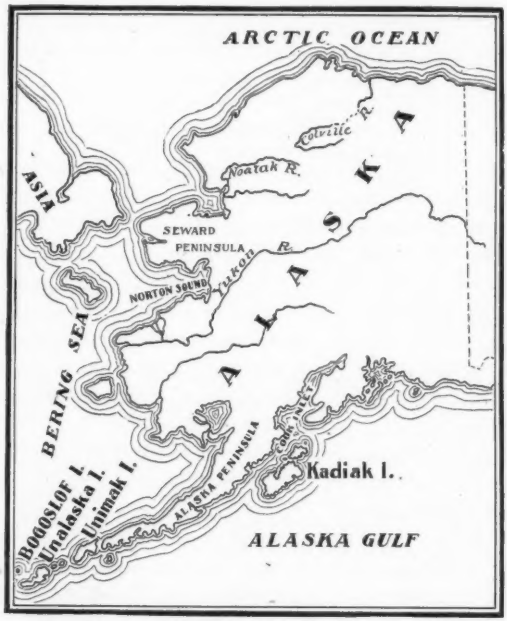
In April of 1907 an expedition started for Alaska from the Massachusetts Institute of Technology to make observations of an unusual sort. Many scientific missions go to remote stations to study eclipses or other stellar happenings, and when a great volcanic eruption or earthquake occurs there is apt to be a rush of geologists, as there was to Mount Pelée in 1902. The Technology Expedition went to the Aleutian Islands in order to make studies of volcanoes without reference to any catastrophe, but the event proved that one of the most wonderful volcanic eruptions ever recorded was there in progress.

Bogoslof, or Joanna Bogoslova, the Island of John the Theologian, rose from the sea in 1796 with turmoil which gave the natives of nearby Unalaska fright. A companion rock was elevated a mile and a half to the northwest of old Bogoslof in 1883, when the earlier volcano, if a rugged reef of rock may be so named, was wholly extinct and the home of many sea-lions and quick-flying guillemots. The new islet was seen by mariners to be a pile of steaming rocks several hundred feet high; and for more than a decade the boiling continued, the island changing its shape and size, and being intermittently connected with the older excrescence by a gravel isthmus. At the end of the century the new volcano of 1883 was also extinct, and appeared as an isolated flat-topped rock in the sea, separated from Bogoslof by an open channel at least a mile in width and probably ten fathoms deep. Together these rocks have been known to the few ocean traders or revenue officers sailing that way as "Bogoslof." The southern older mass is spoken of as "Castle Rock" and the volcano of 1883 was named after the Russian geographer "Grew-

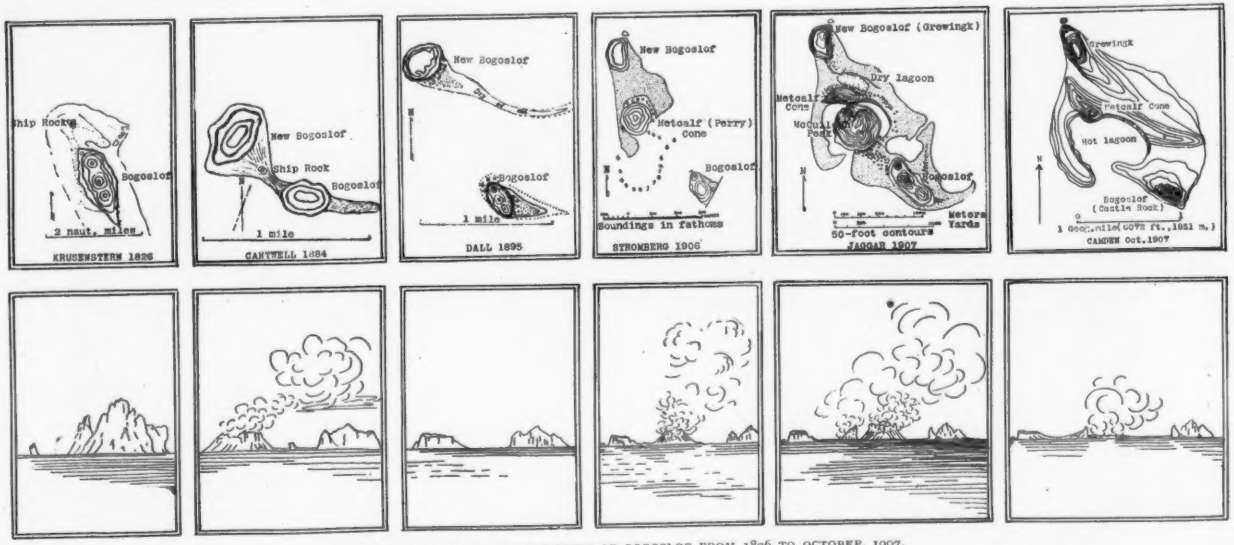
ingk." Among men of science there has always been some mystery about their origin, for no mention of cone, crater or lava appears in the sea-captains' logs. Explosions there were, and violent ones, for we are told that in 1796 an earthquake shook Unalaska, forty miles away, and there were "fearful noises," and "rocks were thrown from the new volcano as far as Umnak." In 1883 dust and sand fell at Iliuliuk, the native settlement sixty miles to the east.

The accompanying photographs reveal an extraordinary change



MAP SHOWING BOGOSLOF ISLAND.

in these islands. New activity began in March, 1906, and by the midsummer of 1907 two new hills had risen from the sea midway between Bogoslof and Grewingk, continuous land united all into one island, and a hot salt-water lagoon encircled the newer hill which was steaming like a pudding. The history of this transformation has been written in scattered letters and magazine articles by navy and revenue officers, correspondents, geologists, and residents of Unalaska. The following abstracts and quotations show in brief the succession of observations recorded, and the pictures illustrate them.



MAPS AND CORRESPONDING SKETCHES OF BOGOSLOF FROM 1826 TO OCTOBER, 1907.

The first three sketches are adapted from Dall 1873, Doty 1884, and Purington 1895; the others from photographs reproduced in this article. (See Merriam, Harriman Alaska Expedition, Vol. 2.)

Lieutenant-Commander Garrett, U. S. N., reported that the *Albatross* reached the Bogoslof Islands May 29, 1906, and found a steaming new cone midway between the two older islands. It was connected with Grewingk by a low flat ridge, but separated by a channel from Castle Rock. This channel was later sounded by officers of the Revenue S. S. *Perry*, and seven fathoms were reported. Garrett wrote: "The new land is conical in appearance, and consists of a mass of eruptive rocks, among which traces of sulphur are plainly visible. It possesses no distinct crater, but numerous vents among the rocks, from which volumes of steam issued." The summit showed a broken horn bending to the northeast, "as though the mass had been forced up through an aperture while in a plastic condition, the sides being quite smooth." This horn proved a remarkable feature, and the key to the whole structure. It has turned out to be a second case of the famous tower of Pelée, which so puzzled the geologists who studied the Martinique eruption. Garrett's suggestion of a rising plastic mass was correct. He proposed for the new hill the name "Metcalf Cone,"* in honour of Secretary Metcalf.

Mr. Robert Dunn visited the new cone in a schooner in July, 1906, and climbed the new peak. He saw that the pudding-like cone had a solid rock core, and the salt-water lagoon which half encircled it on the north had a temperature varying from seventy to ninety degrees. There was no noise. The pinnacle on the summit was like a great parrot's beak, rounded and smooth on the west, but making an overhanging cliff forty feet high on the east. The steam-vents gave temperatures varying from 94° to 212°, and the hottest vent, at the foot of the parrot cliff, was adjacent to rock practically incandescent, for here a piece of paper burst into flame. The top of the spine was about 390 feet above sea-level by pocket barometer.

In the spring of 1907 Captain Dirks, a local trader, brought word that a still newer peak had risen beside Metcalf Cone. The Cutter *McCulloch* visited the scene in July, 1907, and reported that this was indeed true, and, moreover, Metcalf Cone had half collapsed, and the channel between it and Castle Rock was filled up with the new steaming heap, "McCulloch Peak," and a wide stretch of gravel wash. Such was substantially the state of affairs when the Technology Expedition arrived August 7, 1907. A day was spent in exploring, photographing, and collecting specimens. The landing was made in dories in the midst of a herd of roaring sea-lions.

* Later called in press reports "Perry Peak." Commander Garrett's name has precedence.

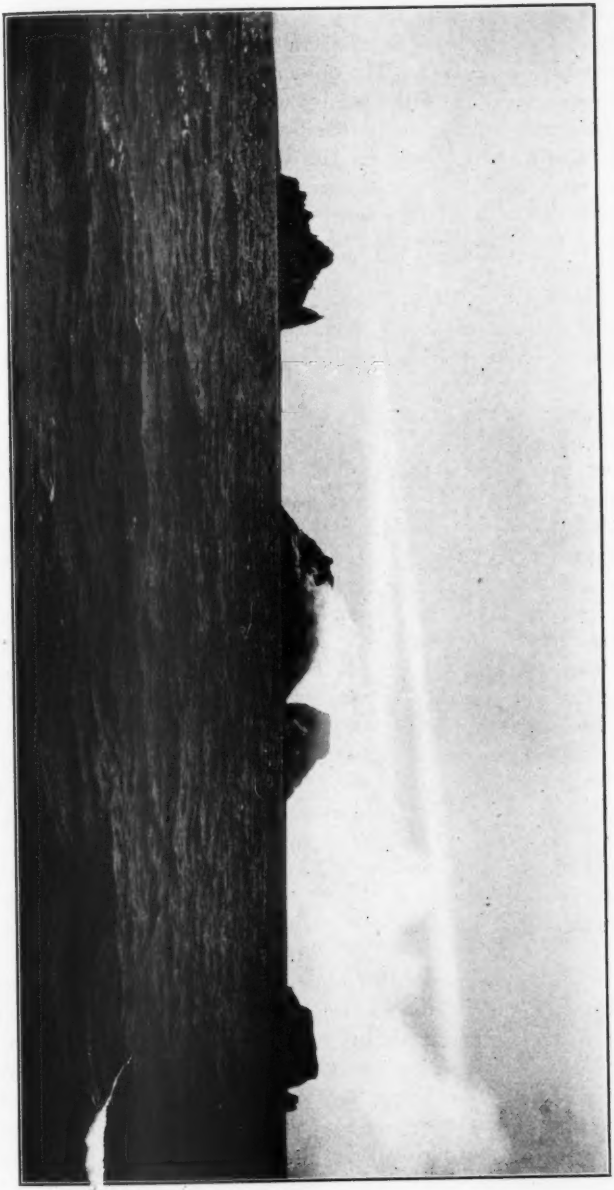
Bogoslof in Sept., 1906. Photograph, by Dr. Ebert, of Revenue Cutter "*Perry*."

These animals when first seen were clustered in great numbers on the sand cusp extending southeast from Castle Rock. Taking alarm they plunged into the sea with much bellowing, and thereafter became divided into separate herds. A shot fired near the precipitous cliffs startled the murres and herring-gulls which nestled there in myriads, and the air was darkened by tens of thousands of them in rapid flight, as they circled far out over the sea and then returned to the cliffs.

The map and photographs show the condition of the island at this time, and it would be difficult to imagine a more extraordinary spectacle. As a land mass above tidewater it was a continuous island about two miles long, with the two new steaming cones in the middle 400 to 500 feet high. Grewingk, flat-topped and cliff-encompassed, guards the north end of the island, while Castle Rock, pinnacled and jagged, rises on the south. The intervening spaces were filled with sand, gravel and volcanic bombs, making wave-washed bars ten or twelve feet above sea-level. It was unbelievable that only sixteen months ago there was nothing there, between the north and south islets, but open water and some ten fathoms of that! In truth it is a land—or an ocean—where the earth is alive, and continents are in the making. "Bogoslof" may, for a time at least, be the name of one island. But what the explorers saw above the sea was only the top of an immense conical mass *beneath* the waves; for Bogoslof on the charts lies forty miles north of the chain of the Aleutian Islands and is just at the one-thousand-fathom line—the new cones are the steaming summit points of a volcano beneath the waves, which is two thousand feet higher than either Vesuvius or Pelée. This lends a new interest to our observations—we are exploring the live crest, equivalent to a crater, of a great submarine heap of lava six thousand feet high, piled above the floor of Bering Sea where the Aleutian mountains fall off to the deep sea.

All the pinnacles of Castle Rock were sharpened between 1906 and 1907—probably by the bombardment of falling stones and sand at the midwinter season when a violent explosion broke Metcalf Cone in twain. There are marks of flood-waves and bombs and pumice on the flats, which give good reason for the belief that the moment which ended the life of Metcalf Cone and began that of McCulloch Peak, in the winter of 1906-7, was explosive, and it will be seen in the sequel that McCulloch suffered a like fate.

A second extraordinary feature of the rocky wall of Castle Rock was a sea-cave at the north end surmounting a rock bench or platform twenty-five feet above the ocean level. This notch and floor



Bogoslof, Aug. 7, 1907, from the east.

could have been made by only one agent—the surf—now beating the strand at a much lower level. It was evident that there had been an uplift of the land. The question at once arose—How long ago did this elevation of the old island happen? On comparison with photographs of 1906 it is found that the uplift of twenty-five feet has taken place during the last year, for those photographs show the same rock bench and cave *at sea-level.* In other words, old Castle Rock had been rising slowly during the last eight months while McCulloch Peak was heaping itself to much greater heights, one, two, three, and, finally, over four hundred feet, with a base measuring two thousand feet across at the beach level. The massive uplift was in evidence all over the island, even as far north as Grewingk, where it was proved by a high sand beach, and a sea-worn barrier of sand and gravel back of the beach, all at levels well above the action of the waves of to-day. While a half-plastic lava was pushing up rapidly in the middle cone, it appears that the adjacent older hard rock summits of the submarine mountain were slowly heaved up. The meaning of this is that either a larger mass of lava is spreading itself sideways somewhere below, and lifting the volcano on its back, or that the whole sea-floor is slowly warping upward and carrying the chain of islands with it.

Next northwestward from Castle Rock, connected with it by a broad gravel ridge flanked by sea beaches and indented by a lagoon on the east, came McCulloch Peak, the most sensational object of recent development. Of rounded cone shape, nearly 450 feet high, this hill appeared at first sight like a steaming heap of bowlders. The top in profile was flattish, but lumpy, made of hard rock, and without any crater. There were rocky crags at the core and summit of the mass, with slide rock about its foot-slopes fed by the tumble from the rising cliffs above. Not that the tumbling or the rising could be seen—it was too slow for that. All was deathly quiet—but dangerous-looking.

Circular in plan, this peculiar volcano was nearly enclosed by a sickle-shaped lagoon of salt water. The water lapped the slide-rock slopes directly, without any intervening beach, the tumble of fragments under water was stained bright orange, and all the water was turbid and hot, steaming silently, at a temperature of about 90 degrees. The peak itself was steaming in places from rifts in the hot rock, and the larger vents showed yellow sulphur coatings. The steam vents were not very numerous, but made a great show owing to the wafting of the vapour by the wind. The vapour was pure white and there was at this time no evidence of explosive

violence or hissing. The rock is hornblende-pyroxene andesite, a refractory lava.

At two places very steep slopes and even jutting rock were seen at the base of the hill, where the slide material was thin over the lava beneath. Generally the core was masked by the slide-rock and the latter was straight and pronounced in the profile of the hill, giving it the cone outline. Above was bedrock and this projected in extraordinary lumps or bulbs. If the foot-slopes could have been washed away the rock core would have looked like a gigantic potato lifting its lumpy protuberances above the waves. Three very large excrescences protruded on the north and northwest, overhanging the lagoon, and one ragged dome could indistinctly be seen on the summit of the hill in the steam.

Protuberances of McCulloch Peak, the Spine and Carapace of Metcalf Cone, and the Hot Lagoon, looking southeast, Aug. 7, 1907.

Only at one point was the slope accessible without wading or swimming and to climb the peak here was impracticable, the slide stones being too loose and the hot rock slope above too steep. On the outer borders of the sickle lagoon were gravel reaches which enclosed it from the sea, as shown on the map.

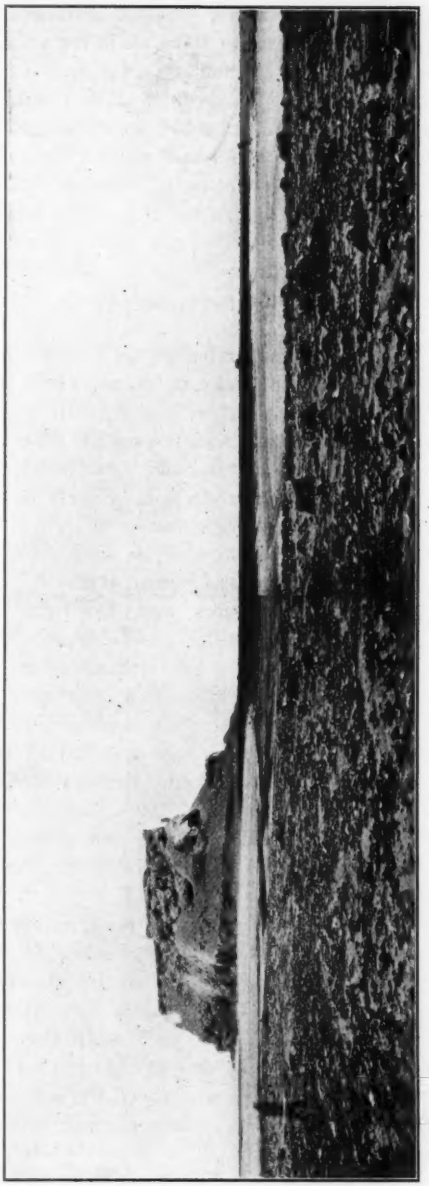
Metcalf Cone, now a half-cone, was adjacent to the base of McCulloch Peak on the north, and it presented on the McCulloch side a sheer face of rock descending to the waters of the hot lagoon. Seen from east or west the profile of Metcalf was like what McCulloch would be if chopped in two with the northern half remaining, and its history corresponds with this description, for it was the preceding year a complete cone of about the same size as McCulloch. McCulloch Cone had grown from the midst of the ruins of the destroyed half of Metcalf. On the upright half of the ruin, the "parrot's beak" was still preserved on the highest point of the summit at the top of the cliff-wall, and its extension downward in the core of the cone was shown in cross-section to the very base, thanks to the freak of nature that had split the cone in two along an up-and-down plane as though for the express benefit of the visiting geologist.

The splitting of the cone in two has left the central spine wonderfully revealed. The middle portion of the wall showed the outline of a spire of about the proportions of a blunted fish-horn or inverted cornucopia, extending from sea-level to the beak on top. The base of the spire was about 360 feet across, and the summit was one third as wide and 400 feet high, rounded towards the west both in plan and profile like a beak. The resemblance to a beak was increased by regular markings on the rounded surface as though the horn had been shoved up at intervals. Apparently it had been squeezed out, like paste from a tube, in a semi-plastic condition, had gradually shaped a roundish cavity for itself in the lava about it, and like a great worm rising from its burrow had turned its head toward the east. Here it broke away through lack of support, making on that side a long slide of fragments surmounted by a ragged overhanging precipice forty feet high.

Under the spine on the north side of the summit of Metcalf Cone there is a turtle-back half-dome surface, ragged and broken on the east just as the spine is, and like the spine curving down to the west beneath a mantling mass of rough lava. The spine, in fact, is a part, the middle part, of a great column of lava enclosed in a hardened carapace or shell. This column rose through a crusty mass of its own substance and became overturned toward the east. The spine was the top of the last central remnant of the fluid lava, which made

one final upward push. Seen from the north, in the direction of Grewingk, the spine resembled a great shark's fin on top of the hill—and such resemblance was also commented on by geologists with reference to the famous spine or tower of Pelée, which was another example of the same process—a stiff and unwieldy lava rising in a nearly solid condition so that it was never permitted to flow downward in a stream like the lavas of the better known volcanoes in Italy and the Hawaiian Islands.

North of Metcalf Cone the site of the lagoon which had been deep and hot in 1906 was in 1907 high and dry. Beyond it a high gravel reach extended a fifth of a mile to Grewingk, a square rocky table 250 feet high, surrounded by cliffs, and highest at the northeast corner. Like Castle



Grewingk, elevated beach and dry lagoon, looking north, Aug. 7, 1907.

Rock these cliffs were the home of innumerable sea-birds. Indeed these hardy birds seem to luxuriate in the volcanic warmth—perhaps it aids the hatching of their eggs, for even on the venomous-looking lava projections of McCulloch Peak, in the midst of steam and heat and sulphur, the birds crowded, as elsewhere, and laid their eggs in the hollows of the rocks and there reared their chicks. Adults, chicks, and eggs occupied every habitable cranny of all the cliffs on the island. Lively the place was in every sense, the hot earth alive, heaving and heaping, the sea alive, currents, surf, and warm lagoons; the shore alive with the hundreds of immense clumsy leviathans, bulls, cows, and pups; and, finally, the cliffs alive with their teeming bird-life.

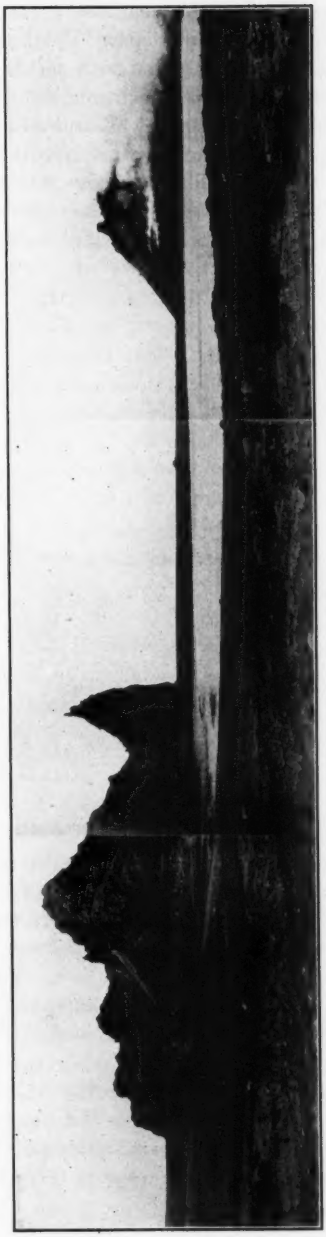
Dr. Van Dyke, naturalist to the expedition, reported finding on Bogoslof beetles, flies, ticks, mites, sea-weeds, and even land grasses. All this combination of activities, with man added, clambering, paddling his frail bark and poking his nose inquiringly into every corner with a view to conscious ratiocination, made of Bogoslof a place for philosophical reflection. Surely here, if anywhere in the world, we were in at the beginning of things, and could take a peep at a continent in embryo, and see land grow fast enough to show results within the limits of human time.

Truly it showed results, and that right soon. On September first, twenty-four days after the Technology Expedition left Bogoslof, the natives, traders, and revenue officers who live at Iliuliuk saw toward the west a dense black cloud rising and the air was full of sulphur fumes. About five o'clock in the afternoon ash and sand began to fall, followed by rain and distant rumbling. A quarter-inch layer from this snowstorm of sand settled on roofs and shipping and grassy landscape, making all appear wan and drooping with a monotonous gray mantle. There were at first many rumours attributing this ash-fall to different volcanoes, for there are over fifty known in the Aleutians.

The Cutter *McCulloch* settled the question in October by visiting Bogoslof and finding McCulloch Peak absolutely gone, a steaming lagoon in its place, and the rest of the island piled high with fallen débris. The map and photograph here shown were made at the time of this visit. The half of Metcalf Cone was still "standing in grim silence as a headstone at the grave of the departed peak." The north slope of Metcalf showed the smooth cone curve, concave in profile upward, so characteristic of cinder-cones like Fuji or Vesuvius, and this marked for Bogoslof one more step in the cone-building process. The pure curve was made by new-fallen frag-

ments added to the lava cone. Lieutenant Camden of the cutter reported that "Castle Rock, on account of its precipitous walls, had no considerable depth of the lava dust deposited on it, and, consequently, its form remains unaltered, but its colour is like Portland cement. At intervals a mass of this lava dust will be jarred or blown from its bed, high up among the rocks, and come tearing down the cliffs to the beach, raising a cloud of dust with it that is almost identical in appearance with the vapour rising near by, and leaving its starting point bare and white in contrast with the colour of the undisturbed dust covering the adjacent rocks." The lagoon where McCulloch Peak had been was a deep bay, open to the west, half a mile in diameter, with steam rising in considerable quantities from the surface of the water, and on its north shore the bank was precipitous and estimated to be 100 feet high.

By analogy with what is known of such volcanoes it is easy to imagine the probable sequence of events toward the end of August which resulted in the demolition of McCulloch Peak. First there came increased pressure of steam through the fissures of the lava, and especially through a main vent somewhere in the centre. On the afternoon of September first explosions from the deep region discharged rock dust and



CASTLE ROCK AND McCULLOCH PEAK, LOOKING EAST, AUG. 7, 1907.
Note the elevated sea-beach along the base of Castle Rock and the sharpened pinnacle.

steam through this vent, and great columns were sent skyward with "cauliflower" whirls charged with solid matter and full of lightnings. At about 5 P. M. this great jet of superheated steam rose perhaps three or four miles vertically and the westerly winds distributed the finer sand and dust, while the heavier rocks fell back on Bogoslof. The explosion undermined the lava of McCulloch Cone, enlarged the vents until the partitions fell in, and the hill crumbled beneath the waters of the lagoon, the cold sea-water quenching and crusting what lavas it reached. Atmospheric disturbances produced local thunderstorms and these brought the eruption to a close.

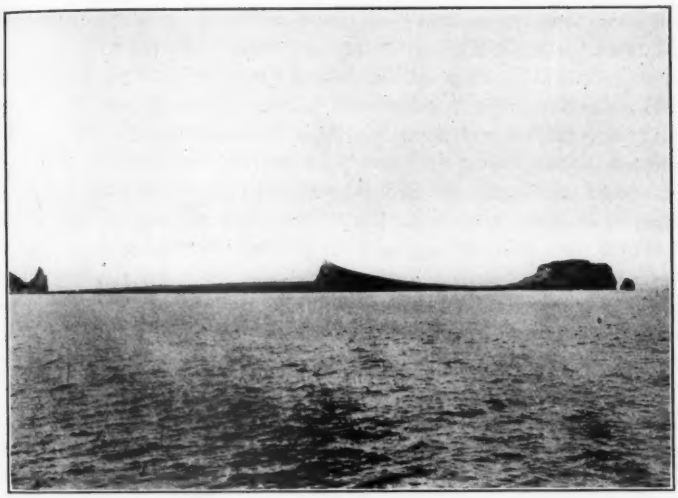
A review of the previous happenings, the rise of Metcalf Cone in 1906, its destruction in the winter of 1906-7, and the welling up of the lava of McCulloch Peak immediately thereafter, suggests that the two cones were the products of repeated stages in the same process, and that the explosion of September, 1907, was the equivalent for McCulloch Peak of what had destroyed Metcalf Cone. If the dates of the several events are examined in the light of this suggestion, there seems to be a rhythmic process shown, thus:

Metcalf Cone rose March, 1906.
Metcalf Cone, 400 feet high, 2,000 feet across.
Metcalf Cone destroyed about November-December, 1906.
Life of Metcalf Cone, 10 months.
McCulloch Cone rose about December, 1906.
McCulloch Cone 450 feet high, 2,000 feet across.
McCulloch Cone destroyed September 1, 1907.
Life of McCulloch Cone, about 10 months.

The mechanism of the process by which these cones rose above the waves and formed protuberances and spines may be imagined somewhat as follows: From a deep fissure in the crust of the earth, under the sea, hard, hot lavas have for many centuries been welling up and crusting over. In contact with cold sea-water, which breaks through fissures to the hot slag, and presses in on it from all sides with mighty pressure, these lavas explode violently and maintain explosion openings, now here, now there, but in general through the top of the heap. Gradually by lava and explosion a great submarine volcano has been built six thousand feet high above the floor of the sea.

Since the latter end of the eighteenth century this lava heap has reared its summit above the waves. Still at certain intervals the lavas creep upward and rend apart the fissure which first gave vent to Old Bogoslof in 1796, and each time explosion plays its part,

perhaps by sea-water making contact with slag, perhaps by force of vapours contained at high pressure in the lava. For a single eruption, like the growth of Metcalf Cone, the dome and spines which rose above the sea were together the top of a body of hard lava rising within an earlier solidified crust of its own substance. The central streams wore cylindrical cavities for themselves in the harder material, moved up and out, bent over, and broke off gradually on the sides away from the bends, leaving rounded surfaces on one side and steep ragged faces on the other. These made the visible pro-



Bogoslof, Oct. 15, 1907. Showing slopes of fallen débris and McCulloch Peak entirely demolished.

tuberances and carapaces. Cooling and solidifying went on throughout the mass, until there was left only a small central pencil of lava pushing up in the middle, most solid and narrowest at the top, progressively wider and more fluid downward within the cone. This made the spine as in Metcalf Cone.

It is a question of some interest whether continued pushing from below did not open ways by which ocean water entered, made steam explosions and so automatically the rising lava accomplished the destruction of what it had built. If this explanation be accepted, then the repeated sequence of events and the like dimensions and life periods of Metcalf and McCulloch Cones are easily accounted for. A single lava column was rising at a uniform rate: it built

Metcalf, became self-obstructed, opened fissures to sea-water and exploded; built McCulloch, became self-obstructed, opened fissures to sea-water and exploded. Did a third cone rise on the spot during the winter of 1907-8 only to be demolished in another ten months or about June, 1908?

The remarkable processes of volcanism and earth movement in the Aleutian Islands deserve continuous, close study from an observatory erected for the purpose on Unalaska. The winter of 1907-8 has been wasted—lost to science, because no observers were stationed there. There are few observatories for the instrumental study of our own earth anywhere, though there are hundreds for the study of the stars. The Geological Society of America at its winter meeting of 1907-8, held at Albuquerque, passed a resolution to the effect that the Society strongly recommends to the several North American governments *and to private enterprise* the establishment of volcano and earthquake observatories. The motives stated are that we possess in the Cordilleran Belt, Alaska, the Philippines, the Hawaiian Islands, Porto Rico, and the Canal Zone, a wide field for investigation of active volcanoes and earth movements; that geological science needs permanent record, made in the field, of physical phenomena accompanying earthquakes and eruptions both before and after the event; and that such record has direct bearing on prediction, and on protection of life and property.

The writer has italicized the words "and to private enterprise," in order to draw attention to a broad unexplored field of research that opens many possibilities to men of wealth, yachtsmen, and to institutions of learning. Exploration, experiment, extended local observation, and permanent observatories are all needed for accumulating data concerning this old earth, which is pushing up and down its shore lines in a hundred places not yet explored, but known to geologists, and building other Bogoslofs.

NORTH DAKOTA LIFE: PLANT, ANIMAL, AND HUMAN.

BY

WALLACE CRAIG.

PART II.*

3. ADAPTATIONS IN BIRD-LIFE.

(3a) *Flatness.* The propensity to travel, common to all the living inhabitants of flat countries, and already illustrated by the seed dispersal of prairie plants, is exhibited again in the exceptional powers of flight of the great majority of prairie birds. The minority of prairie birds, which feel safer when hiding in the grass than when flying, will be treated in the following section (3b). The great majority of prairie birds take wing readily, fly with ease and velocity, and are capable of sustaining and protracting their flight over great distances. The prairie birds are not distinguished, in this fact of superior flight, from the birds which fly over other plain surfaces, such as the ocean, the marsh, and the desert, for the birds of all these plain regions are equally strong fliers; but the plains birds are distinguished from the arboreal birds, which are much poorer fliers. It is granted that certain highly volitant birds, notably the birds of prey, are common to forest and prairie; but these are accustomed, when in a forested region, to make protracted flights above the tree-tops, and it is obvious that under such circumstances the forest becomes to them an unobstructed plain, not essentially different from a prairie. Birds, on the other hand, which fly among, but not over, the tree-tops, never leave the forest for the prairie, and they show in all cases less-powerful, less-sustained flight than their relatives on the plains; such are the whippoorwill, less volitant brother of the nighthawk; the blue-jay, similarly related to the crow; and the vireos, as against the swallows. But the extreme of this contrast may be drawn between the lumbering flycatchers, which return to rest on a tree after catching each fly, and the unflagging swifts, which, if only they can find on the prairie a chimney to hold their nests, need no other resting-place in their miles and miles of circling flight.†

*Concluded from p. 332.

† The flycatchers and the swifts are not related by blood, and are therefore not comparable in the same sense as the other groups mentioned; yet I think it is eminently fair to contrast them, because they are similar ecologically, they fill closely analogous positions in the economy respectively of the forest and of the prairie.

Highly volitant birds flying over a uniform plain tend to gather in multitudinous flocks. Every prairie-dweller is familiar with the long, loose flocks of gulls and terns, the serried flocks of geese and ducks, the massed flocks of sandpipers and plovers. That large flocks are characteristic of the open plain, and that they are not favoured by arboreal life, may be seen by contrasting, in this respect, the prairie-hen and the ruffed grouse, the nighthawk and the whip-poorwill, the crow and the blue-jay, the blackbirds and the orioles, the longspurs and the cardinal or the indigo-bird.

The highest development of the power of flight is seen in the habit of singing (or making other display) on the wing. This habit is virtually restricted to birds of the open. The renowned sky-lark of England is famous because it is, for England, unique. Gilbert White says,* "Birds that sing as they fly are but few," and he gives a list of seven, most of which sing on the wing only, as it were, by inadvertence. In contrast to this meagre list for England, singing on the wing is practised in some degree by every one of the highly volitant songsters of the prairie, and observers there will be able to add new names to the following list of eight birds, all common in the Dakotas, which not only sing while flying, but have developed flight-song to a very high pitch of facility, beauty, and expressiveness. The eight birds are the horned lark, bobolink, Smith's longspur, chestnut-collared longspur, lark-sparrow, lark-bunting, purple martin, and Sprague's pipit. When the males of these species soar and send forth their music from a height, they must be heard by the females for a long distance; this fact foretokens other examples of long-distance perception in the mammals and the men of the plains.

It has already been mentioned, and it is so obviously necessary as scarcely to need mention, that prairie birds are adroit in walking and running. Now, just as volitant bird-life attains its highest expression in the habit of singing on the wing, so it may be said that cursorial bird-life attains its highest expression in those concerted dances, mock-battles, and displays, which have excited the wonder and admiration of all naturalists. Among such performances, that of our own prairie-hen has been accorded a very high rank, both because the performance itself is an elaborate one in which several cock-birds take part, and because the birds have unique features even in their form and structure, which are for no other purpose than this display.†

* Gilbert White, Natural History of Selborne, Letter II. to Hon. Daines Barrington.

† See Darwin's Descent of Man, and Wilson's American Ornithology; under "Pinnated Grouse."

(3b) *Aridity.* In the transition from forest to prairie, as we have already seen, the high-flying birds which sail over the tree-tops of the East, sail over the grass of the prairie with but little concern for the change. We may now ask what becomes of those comparatively weak-flying forest birds which swarm below the tree-tops, thronging the foliage, the tree-trunks, the undergrowth, and the ground. The fact is that all of these species, with perhaps not a single exception, penetrate into the prairie region in narrow lines along the wooded or thicketed river-valleys; indeed, the tapering valleys seem to act, especially during migration, as funnels, concentrating the birds into narrow strips of wood until the trees become thronged even more fully than the trees of the East. The thrushes and warblers, the rose-breasted grosbeaks and orioles which thus throng the woods of the valley, never stray across the boundary-line of their narrow and isolated precinct. Even the Harris sparrow, though it abounds, in season, in every thicket in every river-valley that crosses the plains, and though it has never been seen beyond the confines of the plains region, clings, nevertheless, to its coppices and little clumps of bushes and sedulously avoids the great open plain. The strong contrast and sharp delimitation of valley and plain is, in all its phases, one of the most interesting phenomena in North Dakota; but in no other case is it quite so surprising as in the case of the birds.

The birds of the plains proper must, all of them, except a few that now build on houses, descend to the ground, or even into the ground, to nest. They thus follow the subsidence of the flora which we noted before (2b). The owls of the woods nest in hollow trees; the owls of the plains nest in burrows. Flickers in the forest dig their nest-holes in trees; flickers on the plains dig their nest-holes in the ground. The oriole hangs its nest on the most inaccessible twig of a tall tree; its relative, the meadow lark, finds almost equal security in the concealment of the prairie sod.

A few prairie birds not only conceal their nests in the grass, but at every alarm conceal themselves there also. These constitute the minority of prairie birds, briefly referred to above, which feel safer when hiding in the grass than when flying over it. Such are the various birds known to the country boy as "ground birds," including the vesper-sparrow, savanna sparrow, and others. These contrast strongly with the highly volitant birds described in the last section (3a); but it is obvious, as has just been said, that even the most volitant of prairie birds must come to earth sometimes. There is indeed a great contrast between the vesper-sparrow, which

hardly dares to fly, and the nighthawk, which is hardly able to walk; yet both nest on the ground.

An interesting adaptation to life in a semi-arid country, one which will be further illustrated among the mammals, is the ability to live without drinking. The prairie-hen apparently never drinks any water but the dew; Wilson* tells that a captive bird of this species avoided all standing water, but eagerly drank drops which trickled down the bars of its cage.

Another adaptation to the semi-arid country, one which, again, is common to birds and mammals, is pallid coloration. Proceeding from the dark forms of the moist sea-coasts to the pallid forms of the desert, a regular, continuous lightening may be observed. The uniformity of the lightening suggests that it is purely mechanical,† a mere sun-bleaching perhaps; nevertheless, the light colors of the birds of the plains are useful for concealment on the pale, dusty soil and the whitish herbage.

(3c) *Severe Winter.* The winter birds are fewer in the Northwest than in other parts of the country. Migration is, among the prairie birds, well-nigh universal. The severe cold and the almost complete suspension of life in the flora and the insect-fauna, are unusual incentives to migration. The powerful, protracted flight of plains birds enables them (*e. g.,* golden plover) to migrate farther, on the average, than other birds. In all respects the plains offer exceptional facilities for the study of the marvelous and imperfectly understood phenomenon of bird-migration.

However, even in the bitter winter, those bleak plains are not quite destitute of bird-life. It is a most interesting study to observe how such tiny bodies weather the cold and storm. In bad storms, many birds come searching for food in the farm-yards and even flock into the towns; spring migrants overtaken by blizzards become especially familiar—song-sparrows, Zonotrichias, ovenbirds, thrushes, and many other birds come to the very doorstep or spend whole days in the barn; on such occasions, he must be a hard-hearted man who is not touched by their distress and delighted with their pretty, confiding ways. It is very noticeable, too, that birds are more social among themselves in the winter season, and one cannot doubt that their misery during cold and storm is considerably alleviated by the presence and the constant calls of their fellows.

Prairie-hens, in cold weather, lie in flocks under the snow and are

* Wilson, Alexander, *Loc. cit.*, under "Pinnated Grouse."

† See C. William Beebe, Geographic Variation in Birds, with Special Reference to the Effects of Humidity, Zoologica, vol. I, No. 1. Am. Mus. Nat. Hist., New York, 1907.

thus blanketed from the cold. This habit is strikingly analogous to that of the vegetation (2c).

The paleness of plumage which is useful for concealment on the clay-colored plains of summer is still more necessary on the snowy plains of winter. Some of the winter birds have plumage predominantly white, as the snowy owl and the snowflake.

Bare earth, cleared of snow, is, however, necessary to the existence of all ground feeders. The methods of getting bare earth are strikingly different in the valleys and on the plain, because of the fact that snow settles in the former but is, to a considerable extent, swept off the latter (cf. 2c). The terrestrial birds of the valleys (Junco, Zonotrichia, etc.) do not stay in North Dakota through the winter when the valleys are clogged with snow; after their return in the spring, if overtaken by a blizzard, they seek the most sheltered situations and there, if they do not find bare earth, industriously scratch away the snow. Terrestrial birds of the plains (larks, longspurs, snowflakes, all of which breed farther north) do remain in Dakota through the winter; during a blizzard it is obviously impossible for them to scratch away the snow, hence they seek the most exposed situations, where the soil is swept bare by the wind. Nothing can inspire a man with more fortitude to endure the Dakotan winter than to go out in a blizzard and see these tiny birds, flocking on the most exposed situations, busily searching the frozen earth for food, and, with their cheery little notes, making the winter merry.

4. Adaptations in Mammalian-life.

The adaptations to plains life in the mammals are analogous to those in the birds. Hence I shall mention here only those points which are obscure or not generally known. The reader will find other details in the accompanying table.*

(4a) *Flatness.* Great locomotor activity, migration, and aggregation in large companies characterize the mammals as well as the birds of the plain. With regard to locomotion there is, however, this difference; powerful flight in a bird, as has already been noted (3a), makes the bird independent of any particular type of topography; but the locomotion of a mammal is specialized for one sort of country. Forest mammals excel those of the plains in surmounting obstacles and traversing rough country; plains mammals excel those of the forest in sheer speed upon a level tract.

* From this point onward many details that are not mentioned in the text are given in the table.

The large hoofed mammals, which most strikingly illustrate these principles, are now, unfortunately, almost exterminated, and one must be content with a second-hand knowledge of them. The bison (less correctly called the buffalo) is one of the most characteristic products of the plains; and we are told that "The gait of the buffalo is at all times more active than that of other oxen. Not only is the walk brisk, but the trot and gallop enable him to cover the ground very rapidly. For a mile or so he is a good match for a horse." Also, the bison is "more sociable in his habits than any of his immediate relatives."* Migrations were performed on an extensive scale in the years of the bison's abundance. The pronghorn, another characteristic plains type, its original range having been precisely co-extensive with the plains, was likewise gregarious and somewhat migratory.† In its long course of evolution on the plains, the pronghorn has gained the fleetest foot on the American continent; but it has so completely lost the power of jumping over obstacles that the Indians captured it in numbers by corralling the herds within a slight brushwood fence.‡ The same prairie which developed the bison and the pronghorn developed to a similar state of specialization another hoofed animal, which, in recent geologic time, changed its residence from America to the Old World. There its unexcelled speed and endurance and its social tractable disposition made it the useful slave of mankind. Upon the discovery of America it was brought back to this continent and speedily restocked its ancestral prairies. Need I tell my readers that this animal was the horse?

With regard to the formation of large societies, one of the most characteristic animals of the plains is the prairie-dog. This little rodent has been known to form "towns" containing millions of individuals; one such town has a length of about a hundred miles.§ The existence of such a prairie-dog town is obviously dependent upon an equally extensive plant-association.

(4) *Aridity.* As can be seen by a glance at section 4b in the table, the prairie mammals, as well as the prairie birds, have followed the prairie plants in their subsidence into the ground.

Large mammals are necessarily ground feeders. Tall trees, though they favor large animals with shade and concealment, are a great detriment to the food supply. The deer of the forest are

* R. Ramsey Wright, in the Riverside Natural History, vol. V, pp. 317-318. Houghton, Mifflin & Co., 1888.

† *Ibid.*, p. 335.

‡ Herrick, Mammals of Minnesota. Geol. & Nat. Hist. Surv. of Minn., Bull. No. 7, 1892, p. 288.

§ Hornaday, The American Natural History, p. 77.

largely dependent for food upon the breaches in the forest—the fields and pastures cleared by man, the second-growth in burned areas and wind-falls, the herbs of the swamps, lake margins, and river-banks. In some parts of the forest, where the trees are tall and there is no undergrowth, even a giraffe would starve. Now, the bison is the antithesis of the giraffe. The bison, with its ponderous body raised but a short space above the ground, and with its ponderous head incapable of elevation, shows the extreme of inaptitude for browsing, and the extreme adaptation for grazing. The tremendous weight of this animal, together with the enormous numbers* with which it once stocked the prairie, is a tribute to the concentrated richness of the prairie flora (2b).

The rodents have followed the subsiding flora not merely to the surface of the soil, but into its depths; they have become not only terrestrial but fossorial. Squirrels in the East are tree squirrels, they feed on nuts, and nest in the branches; squirrels of the plains are ground-squirrels, they feed on grain, and nest in burrows. The extreme transmutation, however, is seen in the pocket gopher,† which, feeding upon the copious roots and tubers of the prairie, has become almost as completely subterranean as the mole, and almost as completely transformed in external form and internal structure. In hard and root-bound soil, such as characterizes the prairie, the pocket gopher is even more capable of burrowing than the mole, for its fore-claws are more powerful, and it has enormous incisors with which it digs as with a pickaxe. While these front teeth are digging the soil, the hind part of the mouth is kept closed and free from dirt by a special and unique formation of the lips. The animal's other adaptations to fossorial existence are too numerous to mention; suffice it to say that the pocket gopher, all told, is the consummate expression of the earthward tendency of the prairie biota.‡

Moles are absent from the plains; they could not find there the worms and soft grubs on which they feed, because for these worms and grubs the prairie sod is too dry.§ The degree of soil humidity necessary to the existence of such creatures is at so great a depth that they cannot live there. In this we see another illustration of

* W. T. Hornaday, Extermination of the Am. Bison. Smithson. Rep., 1887, pp. 387-393.

† C. Hart Merriam, Monographic Revision of the Pocket Gophers. N. Am. Fauna No. 8. U. S. Dept. Agr., Washington, 1895.

Vernon Bailey, The Pocket Gophers of the United States. U. S. Dept. Agr., Washington, 1895.

Ernest Seton-Thompson, in Century Magazine, vol. 68, pp. 300-307.

‡ Biota-fauna and flora, or all the life of a given region.

§ F. W. True, A Revision of the Am. Moles, Publication No. 1101, Smithsonian Institution, Washington, 1896, p. 12.

the downward displacement of the prairie biota; the animals which constitute the lowest stratum of life in the forest have been pushed so far down in the prairie that they have been ruled out of existence altogther.

In contrast to the mole, the pocket gopher can subsist in a very dry soil. It can live without drinking; indeed, so far as is known, it is incapable of drinking.* It finds no inconvenience in obtaining all the water necessary to its existence from its vegetable food. This gift is common to many vegetable feeders, including the hare and the prairie-dog. † Livingstone‡ tells us that in the Kalahari desert elands, steinbuck, gemsbuck, and ostriches live for months together without drinking. It would be interesting to determine for how many days our pronghorn§ habitually goes without water.

(4c.) *Severe Winter.* The effects of the severe winter upon mammals are easily understood from the table. I wish to add only two interesting facts about winter coats. The first is, that horses brought to Dakota from the South (I quote those who have tried the experiment) grow in the Dakotan winter a dense and rough coat such as they never possessed before. The second is, that the bison's hair is so ordered in its shedding and growing that in June its skin is almost bare, and early in the winter following, the new coat is in its prime—long, dense, and silky. The hardiness of the bison in cold and storm far surpasses that of all our domestic animals.

5. Adaptations in Indian-life.‖

(5a, b, c.) The vast, level, easily travelled configuration of the plain, and the immense herds of bison (4b), were the two overwhelmingly predominant facts in the environment of the plains Indian. The first, by allowing ceaseless friction between tribe and tribe, made the Indian a warrior; the second, by offering an ever-present store of food and clothing, made him a hunter; both together made him a nomad, following the herds of bison in their migrations across the vast plain. "Of all the great stocks south of the Arctic,"

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* Herrick, *Loc. cit.*, p. 229.

† Hornaday, The American Natural History, Scribner's, 1904, p. 77.

‡ David Livingstone, *Loc. cit.*, p. 64.

§ See Ramsay Wright, *Loc. cit.*, p. 335.

‖ My information regarding the plains Indians is derived chiefly from the following sources:

O. T. Mason, Influence of Environment upon Human Industries or Arts, Pub. No. 1060, Smithsonian Institution, Washington, 1896.

W. J. McGee, The Siouan Indians, 15th Ann. Rep. Bureau Ethnology, pp. 153–204. Washington, 1897.

J. O. Dorsey, A Study of Siouan Cults, 11th do., pp. 351–544. Washington, 1894.

N. S. Shaler, Nature and Man in America, Scribner's, 1891.

says McGee,* "the Siouan was probably least given to agriculture, most influenced by hunting, and most addicted to warfare." No doubt these traits existed in the Dakota,† though in an inferior degree, before his settlement upon the prairie; no doubt they were the cause of his choosing the prairie for his home (and this again shows the intimate relation between the Siouan Indian and the prairie habitat), but when settled on the prairie he was prevented from passing beyond the hunting-fighting stage. Progress beyond this stage can only occur within the protection of great natural barriers, barriers of mountains, or wilderness, or waters. The plains afforded no barriers whatever; hence, the plains Indian was ever surrounded by enemies, ever prepared for war, ever ready to move, not impeded with growing crops, but dependent instead upon wild meat.‡

Since the prairie determined these major occupations, it controlled the whole existence and mode of life of the plains-Indian. I shall bring together facts and quotations to show the profound influence of plains-life upon the Dakota's physical characteristics, his games, his religion, his social organization, his language.

The influence upon physical characteristics is concisely set forth by McGee.§ He says, "The vigorous avocations of the chase and war were reflected in fine stature, broad and deep chests, strong and clean limbs and sound constitution." The Dakota is the prototype of that august figure which appears in the mind of the average man whenever he thinks of the "American Indian," a figure which is erroneously ascribed to the whole American race. It is true that the plains Indian did not turn out his toes, and this has been imputed to him as a fault; but in truth it is part of his perfect adaptation to life on the vast plains, for feet-parallel is the attitude of the great runner whereas the out-toed position characterizes those who habitually stand still.

The games of the Siouan boys were mimic hunts and sham battles; the pastimes of the adults were games of chance, reflecting their precarious mode of life. The temperament of the Siouan was the stoic. His religious ordeals‖ were most cruel and bloody. His religious ceremonies were replete with images, skins, and skulls of the American Bison. His heaven was awarded to the brave warrior and the skilful hunter.¶

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* 15th Rep. Bureau Ethnology.

† The Dakota is a major branch of the Siouan stock.

‡ Shaler, *Loc. cit.*, pp. 168–173, 181–187.

§ McGee, *Loc. cit.*, p. 185.

‖ Dorsey, *Ibid.*, especially pp. 450–463.

¶ *Ibid.* (Dorsey), p. 422.

The discipline which is indispensable in any body of fighting-men, gave rise to a most elaborate social organization; a complex hierarchy was maintained, with the aid of a strict and ceremonious etiquette. And since each military organization on the continuous plain might easily become crippled by defections or strengthened by alliances, the Dakota became a tactful diplomatist, a skilful reader of human nature, and, through the practice of dissimulation, a consummate actor.

"The tongues of the plains, which have been most extensively studied, are notably melodious. . . . The high phonetic development of the Siouan tongues reflects the needs and records the history of the hunter and warrior tribes, whose phonetic symbols were necessarily so differentiated as to be intelligible in whisper, oratory, and war-cry, as well as in ordinary converse."* Some of these melodious vocables, such as Wahpeton, Dakota, Iowa, have, fortunately, been given a permanent position in the nomenclature of the plains.

The dramatic and oratorical powers of the Dakota led, in conjunction with certain other factors, to the development of a wonderfully complete and efficient sign language. The warlike habit of these Indians favoured the development of sign-language by retarding the development of graphic language. The facility of long-distance perception on the open plain must also be taken into consideration: a statement was made previously (p. 324) as to how much information an Indian could get even from a dust-cloud rising beyond the horizon; now, where the Indian's perceptive powers were so remarkably developed, and where he could, when he wished, be seen by his companions for miles in every direction, it is but natural that he should have evolved a code of signs, of which some at least could be seen and interpreted at long range. "This mode of conveying intelligence," says McGee,† "attained perhaps its highest development among some of the tribes of this [the Siouan] stock, who, with other plains Indians, developed pantomime and gesture into a surprisingly perfect art of expression adapted to the needs of huntsmen and warriors."

All these important characteristics of the Dakota are, then, bound up with the flatness of the plain and the abundance of the bison; and the abundance of the bison is, as we have seen (4b), dependent upon the prairie condition, which in turn is dependent upon aridity. It may be added that the roving disposition of the Indian is analogous to the proclivity to travel, in the plants, the birds, and the mammals;

* McGee, *Loc. cit.*, p. 168.
† *Ibid.*, p. 168.

that the Indian's great social organization is analogous to the social organizations of the prairie birds and beasts; that his sign-language is due largely to the same fact of free space which has developed the soaring-song of the lark.

The numerous other facts given in column 5 of the table, facts which are too well-known to need explanation, refer chiefly to arts and industries, showing that these also are under the dominating influence of the flatness, the aridity, and the severe winter of the plains, and that they are analogous to certain facts in the bird-life and the mammalian-life of the region.

6. Adaptations in Pioneer-life.

(6a, b, c.) The romance of pioneering days on the plains—the months-long journeys, the battles with the Indians, the hunting of the bison, the immense herds of cattle, the stampedes, the wildness of cowboy life—has become so well-known through magazine articles, stories, and histories, that a description here would be a work of supererogation. I have endeavoured to show in the table that all the romantic features of pioneer-life on the plains may be referred to the same causes which have produced the wonders of the plant and animal life of the plains. If this be true, the romance of the plains has not passed away with the passing of the bison and the cowboy; it finds expression in every bird, every flower, every grass-blade on the prairie.

7. Adaptations in Civilization, and Review, showing the Analogies extending through Sections 2-7.

(7a.) *Flatness.* Civilization tends to bring all regions to the condition of the unobstructed plain. Though it was said in section 5 that early civilization requires great natural barriers to protect it from its barbarous neighbours, after the cradling stage is passed civilization is retarded by barriers and advances most rapidly where travel is easiest.* Civilized man is a plains-dweller; if compelled to live in a mountainous country, he reduces its unevenness by filling and grading, bridging and tunnelling; if compelled to pass through a forest, he converts part of the forest into a plain by removing the trees. Consequently, the ease of travel and communication which was in the natural state of the country confined to the plains regions

* N. S. Shaler, *Loc. cit.*, pp. 168–173.

has now been extended artificially over the greater part of the United States.

Nevertheless, the plains still maintain and always shall maintain a superiority in this respect. The plains are distinguished by excellent wagon-roads, which scarcely need to be paved, and by railroads which run for hundreds of miles with practically no curves and no grades. These are adaptations to the easily travelled surface of the country, and, as such, they are analogous to all those adaptations to the traversability of the plains which were mentioned in preceding sections; namely, the "prairie-schooner" of the pioneers (think how soon a "prairie-schooner" would come to grief in a rough, forested country); the Indian's nomadic habits, his burden-bearing dogs, and his travail; the tirelessness of the coyote and the swiftness of the pronghorn; the far flight of the longspurs and the cursorial habits of the prairie-hen. Finally, the tumbleweed, rolling along the level plain, is strikingly similar to the car-wheel rolling along the rail.

The traversability and the uniformity of the plains facilitate social aggregation and organization. The result is seen first in the very extensive plant associations; these impress us by the enormous numbers of individual plants which they include, and by their vast continuity, though they show but little of that mutual aid and organization which characterize a society in the sociologist's sense of the word. The myriad flocks of prairie birds show more of mutual aid and organization. The enormous herds of bison show, in some respects, still more. In the society of the plains Indians, it is the organization that attracts our attention, the number of individuals being but moderate. In the society of civilized man on the plains, the same is true: North Dakota contains but a moderate number of people, but these people show a geographic unity, a social solidarity, and a political discipline which they could not possibly show if they were not in a plains country. The immense farms and cattle ranches are a conspicuous result of geographic unity in the realm of economics. The same condition manifests itself in the realms of society and politics. The fact that every man on the plain is in full view of all his neighbours all of the time develops in him a strong social sense. The absence of mountain or forest retreats makes it difficult for any man to make an exception of himself. The uniformity of conditions throughout the entire State makes it possible for people from every section of the State to act together in harmony. A complete description of the consequences of these conditions would transcend the limits of this paper. But any one who has lived some years

in North Dakota, and other years in regions of mountainous or diversified topography, must have observed for himself that the conditions in North Dakota are highly favourable to political and social organization of the people.

The broad and open view which surrounds every house in North Dakota becomes an object of the sincere affection of the prairie-dweller. If one who has lived for many years on the prairie travels to a hilly, forested, or urban region, he longs to return to where the horizon is a perfect circle, where the whole sky is always in view, and where a man can watch the goings and comings of his neighbours for miles in every direction. Thus we see that even the civilized man is strongly affected by that tendency to long-distance perception which, as we have seen, characterizes the plains Indians (p. 324), the plains mammals, and the birds that sing on the wing.

(7b.) *Aridity.* It was said in section 4b that large mammals are necessarily ground-feeders, and that for this reason the low, rich herbage of the prairie is the vegetation best suited to maintain large mammals in quantity. In this respect, man resembles the other large mammals. A dense population could never be fed in a forest. True it is that certain trees and vines are cultivated for their fruit; but the trees are purposely dwarfed, and the vines are trailed on fences or on the ground; moreover, all the trees in the world would make but a poor showing when contrasted, in the statistics of food-supply, with the combined product of all the herbs and grasses. Civilized man has destroyed the trees and drained the soil over immense areas of forest land in order to make room for an artificial condition closely resembling the natural condition of the prairie. This artificial prairie is devoted to the production of a great variety of herbs and a few invaluable forms of grass—pasture, hay, maize, barley, rye, oats, and wheat. Nevertheless, the natural prairie region still maintains a certain superiority in the quality of its food-roots, grass, and grain.

That subsidence into the ground which was exemplified by the great root-development among plants, and by the terrestrial habits of birds and mammals, finds an analogue in the earth lodge of the plains Indians and the "dugout" of the early settler. A little thought shows that the artesian wells of civilization are another analogue; just as the alfalfa plant, because water is scanty at the surface, bores for it even to a depth of 120 feet, so the human species, because water is scanty at the surface, bores for it even to a depth of 1,200 feet.

(7c.) *Severe Winter.* The analogies between the winter adapta-

tions of the various types of life are interesting, and, in some cases, remarkably complete. These, I think, are perfectly clear and obvious in the table, with the exception of two which I shall briefly explain.

The contrast between the valleys and the plain, which obtains in so many respects, is not least interesting in respect of the distribution of snow. Men who live in the valleys, where the drifting snow settles down, find it necessary to dig away the deposit after every storm; but those who live on the windy plain find it much better to arrange houses, roads, and wind-breaks in such a manner that the wind will do the snow-sweeping. This contrast in the methods of obtaining clear ground is the same as we found in the birds (3c.), the ground-birds of the valley scratching away the snow, the ground-birds of the plain seeking spots swept bare by the wind.

Another close analogy between men and birds is seen in an increased sociality in winter. The wagoner who is overtaken by a furious blizzard must needs stop at the first house and ask (he needs to ask but once) for shelter for his horses and himself. So the birds, when overtaken by the blizzard, come to our houses and ask, in their pretty way, for shelter.

I wish to call attention, finally, to an analogy between two prairie products which depend upon the flatness of the surface and the richness of the herbage combined, and which could not therefore be classed under either (a) or (b). The first of these is the modern reaping-machine. As the North Dakota farmer watches one of these almost human machines passing across a field of wheat and every moment converting a patch of standing grain into a cut and tied bundle, he reflects with pride that if it had not been for the flat surface and the rich grain of the prairie regions, man would not now have had this wonderful servant, the self-binder. His pride might well be multiplied a myriad-fold by the reflection that if it had not been for the same flat surface and the same richness of vegetation on the prairie, man would never have had that most indispensable and most wonderfully perfect of all his servants—the horse.

Conclusion.

Now, enough has been said to show the truth of the statement made in the beginning, that those very features of North Dakota which are most unattractive to a newcomer—the flatness, the barren appearance, and the severe winter—are the causes, or the concomitants, of many interesting peculiarities, including much that is artistically beautiful and much that is scientifically fascinating.

NORTH DAKOTA LIFE: TABLE SHOWING THE ANALOGIES IN ADAPTA

CONDITIONS AND 1. ATMOSPHERIC APPEARANCES.	→ ADAPTATIONS → 2. PLANT-LIFE.	3. BIRD-LIFE.	4. MAMMALIAN-LIFE.	
a. Flatness — traversability →	Seeds travel . . . . . — carried by wind. — rolled along ground.	. . { good runners } . . . . { good fliers }	good runners . . . . . — coyote, hare, etc.	rove — — —
		— migration	— migration	
	extensive associations	. immense flocks	immense herds . . . . . — prairie dog towns.	. gr
— visibility of all objects →		{ singing on the wing, seen and heard for long distance . .	. . perceive enemies long distance.	{ sig { pr
b. Aridity. — valleys more moist	Reduction of aerial surface — plains treeless → — trees in valleys →	terrestrial on plains . . . . arboreal in valleys	terrestrial on plains . . . . . tree-squirrels in valleys	{ no { wo
	— concentration — near the ground — nutritious } →		quantity of bison →	{ ten { sin { cor
	— subterranean extension . . (great roots)	. . burrow in ground . . .	. . burrow in ground . . . . (prairie-dog, ground-squirrels, etc.)	. .
	drought-resistant . . . . . spines, thorns ←	live without drinking . . .	. live without drinking . . . . obtain water from plants	. .
	light color	light color	light color	
c. Severe Winter plains swept bare, in spots valleys, deep snow.	Reduction of aerial surface — plains treeless — valleys with trees	seek wind-swept spots . . . . dig away snow. (in valleys)	. . seek wind-swept spots . . . . dig away snow	. .
	— subterranean (die to ground)	. . . . burrowing (owl) . .	. . burrowing	. en
	almost complete suspension of life	. . . . migration	. . . migration, hibernation . .	. .
	hairy covering		fur	skin
		increased sociality	herds keep each other warm	. .
snow { →		white color	white color (wolf, hare)	
snow { →		snow-shoe-like foot of grouse	. . . . .	. .

Dotted line . . . . or a single dot, thus { . } indicates the relation of analogy.

Arrow ——→ indicates relation of (probable) cause-and-effect, and leads from the cause to the effect.

The numbers, 1 to 7, and letters, *a*, *b*, and *c*, are used also in the text, dividing the text into sections to correspond with the sections of

N ADAPTATION OF PLANT, ANIMAL, AND HUMAN LIFE.

	5. INDIAN-LIFE.	6. PIONEER-LIFE.	7. CIVILIZATION.
	rovers, warriors, hunters, not farmers — travail (primitive vehicle) — fight in open, use horses — effects, athletics, ceremonial, religious — migration	rovers — "prairie schooner" fight Indians in open	railroads without grades or curves. good roads. perfection of farm-machinery.
	great social organization	great herds of cattle and horses — boundless ranches — (cowboy life)	immense farms. caravans of harvesters. — social and political results.
distance.	sign language perception at long distances	men insepara	bly attached to the "broad view."
	no birch-bark wood used only for tent-poles and furniture " fetched from Rocky Mts.	"buffalo chips" for fuel wood brought from distance	straw for fuel. wood brought from Minn., Ore., Wash.
	tents of skin, boats of skin, sinew-backed bow cordage of sinew and intestine	big-game hunting quantity of cattle	rich grazing concentrated kernel of wheat. — increasing population and wealth.
els, etc.)	earth lodge	sod-house and dugout	deep wells (1200 feet). root-crops large.
ts		carry water on journeys	"dry" farming.
			arrange houses, etc., so that wind sweeps clear of snow. dig away snow, in valleys
	earth lodge in winter	sod-house and dugout	"bank" houses with earth.
tion	migration	out-of-door work suspended traffic blocked	out-of-door work suspended. traffic blocked, schools closed.
	skin-clothing, skin-tailoring	fur clothing	furs and woollens industry.
rm		hospitality during blizzards	hospitality during blizzards.
	snow-shoes	snow-shoes	skis

the sections of this table.

Among the consequences of flatness, aridity, and severe winter, I have mentioned sunny skies by day, and wonderful stars by night; gorgeous sunsets; beautiful snow scenes; the curious compass plant; birds which soar at great height and pour forth their melodies from the sky; bison which astonish us by their ponderous bulk and their almost incredible numbers; Indians which reached the highest ideal of their savage and warlike existence; and pioneer white men whose romantic stories have become inseparably connected with the plains. But more impressive, to my mind, than all these isolated facts, is the deep-lying sympathy between the plants, the animals, and the men, that must all adapt themselves to the same hard conditions; the consequent similarity of behaviour in even the most diverse forms of life; and, finally, the extent to which the most wonderful products of plains civilization have been foreshadowed, and in some cases, I may say, even excelled by the work of the primeval inhabitants.

Let no one think that I have attempted an exhaustive study. A reader familiar with the prairies, on looking over the table which I have drawn up, will wish to add many an illustration here and there, and perhaps to add new columns and new sections. It is to be hoped that such readers will extend and modify the table wherever they see fit to do so; for my whole presentation is intended to be suggestive, not assertive. For this reason I have been content to include my entire scheme under seven headings, which, since they embrace but one class of physical phenomena, and several fractions of the biota, obviously do not cover the entire field. Even those groups of phenomena which are included are, after all, barely touched upon. In short, the study of the atmospheric appearances alone, or of the plants, or the birds, or the insects (which I have not touched at all), if such a study were undertaken by a settler on a North Dakota farm, would keep him interested and delighted through all the years of his natural life.

GEOGRAPHICAL RECORD.

AFRICA.

DISASTER TO AN AFRICAN EXPEDITION.—The Duke of Mecklenburg, accompanied by a number of scientific experts, went to East Central Africa over a year ago to engage in surveys and zoological, geological, ethnographical, and other researches. Reaching Bukoba on the German coast of Victoria Nyanza on June 9, his party surveyed districts along the Kagera River, discovered a new tributary

stream, and then travelled southwest to explore Lake Kivu and the volcanic region in its neighbourhood. Brief reports of the work in this region have been published in the *Geographical Journal* (April, 1908), the *Deutsches Kolonialblatt* (Feb. 1, 1908), and in the *Zeitschrift* of the Berlin Geographical Society (1908, No. 1). Dr. Kirschstein, the geologist of the party, came to the conclusion that the activity of the volcanoes is dying out progressively from east to west and is at present greatest at Mount Namlagira. Studies of the fauna of the mountains were made by Dr. Schubotz.

For some months very little had been heard of the party till the receipt of a letter containing startling information. The letter was written by Dr. Kirschstein at Kahama in the volcanic area and was dated March 5 last. It was signed by the Duke of Mecklenburg and published in the *Deutsch-Ostafrikanische Zeitung*, in its issue of May 2, 1908. The letter said that the expedition had been overtaken by a terrible snowstorm at a high altitude and twenty of the black porters had perished.

On February 27, the researches on Mount Karissimbi were completed, and the party broke camp on the edge of the Branca crater in order to return to the base camp. As it was desired to descend to the south foot of the mountain, it was thought time would be saved by crossing through the Branca crater instead of going around it to the south side. A shallow swamp occupies the larger part of this crater.

Suddenly, almost from a clear sky, a severe hailstorm set in and this was soon followed by a furious snowstorm, the temperature falling in a short time to the freezing point. The expedition was more than half way across the swamp when the storm overwhelmed it. The porters were frantic with terror and kept shouting "we shall all die." They threw down their loads, and neither pleadings, commands, nor threats could move them.

On the further edge of the crater towards which they had marched were some trees, and the Duke's aim was to reach them and build a fire. The whites and a few other men started for the trees and soon clambered up the crater side to them. Finding dry wood, they kindled a fire and went back to rescue, if possible, the men who were still in the swamp. The unfortunate blacks were found practically incapable of moving.

As many as could be carried on the first trip were taken to the fire and the journey was repeated several times, a considerable number of men being rescued. The complete exhaustion of the rescuers, as well as the darkness, at length compelled them to desist from further effort. They spent a sleepless night by the camp fire and at daybreak went down into the crater again and found twenty of the men dead. One man showed some signs of life, and when the letter was written he seemed likely to recover. Ever since the sad occurrence the Duke had been confined to his bed by fever. The supplies, collections, etc., which had been left in the swamp were recovered later.

POPULATION OF THE FRENCH CONGO.—The *Bulletin* of the French Colonial Office, in its February number, prints the results of the census of the French Congo and the territories of the Chad. The figures are: Gaboon, 376,000; middle Congo, 259,000; Mobangi-Shari, 2,130,000; Chad, 885,000; total, 3,650,000, of which 1,278 are Europeans, including 502 officials and soldiers and 776 colonists, merchants, and missionaries. It was commonly supposed that the population was much greater, and de Brazza estimated it as from 7,000,000 to 8,000,000.

BRIDGING THE BLUE NILE.—European newspapers give interesting particulars concerning the steel bridge which is now being built across the Blue Nile at Khartum. It is to be supported on seven large and seven smaller stone piers, between two of which is a passageway, 111 feet wide, for the river shipping. The length of the bridge will be 1,700 feet. A longitudinal section is reserved for a railroad track on which the trains from Egypt, now stopping at Halfaya on the north bank of the Blue Nile, will cross to Khartum, where the railroad station will be in the heart of the city. The wagon traffic will have a roadway 21 feet wide and the footpath will be 11 feet in width. The railroad station will be the starting point for the northern section of the Cape to Cairo Railroad, which it is expected will be extended southward to meet the southern section, now completed for about 1,900 miles north of Cape Town. It is believed that the bridge which will carry the railroad into Khartum will considerably enhance the importance of that city's business relations with the rest of the Anglo-Egyptian Sudan.

AMERICA.

CANADA'S HIGHEST MOUNTAIN.—Dr. Coleman of the Geological Department of Toronto University and the Rev. C. R. B. Kinney will attempt this summer to ascend Mount Robson, supposed to be the highest mountain of Canada and never yet climbed. Starting from Edmonton about August, they will ascend the Athabasca River to its sources. A little further west, in the basin of the Fraser River, stands Mount Robson. The mountain has been known for many years, though the general public has heard little of it. It is briefly described in "The Northwest Passage by Land," p. 257, written by Viscount Milton and W. B. Cheadle and published in 1865. They said:

> On every side the snowy heads of mighty hills crowded round, whilst, immediately behind us, a giant among giants, and immeasurably supreme, rose Robson's Peak. This magnificent mountain is of conical form, glacier-clothed, and rugged. When we first caught sight of it, a shroud of mist partially enveloped the summit, but this presently rolled away, and we saw its upper portion dimmed by a necklace of light feathery clouds, beyond which its pointed apex of ice, glittering in the morning sun, shot up far into the blue heaven above, to a height of probably 10,000 or 15,000 feet. It was a glorious sight, and one which the Shushwaps of the Cache assured us had rarely been seen by human eyes, the summit being generally hidden by clouds.

Mr. James McEvoy of the Canadian Geological Survey, who described this region in the *Annual Report* of the Geological Survey of Canada (Vol. XI, 1898), says that the top of the mountain is usually completely hidden and rarely is it seen entirely free from clouds. The actual height of the peak is 13,700 feet, or 10,750 feet above the valley. The face of the mountain is strongly marked by horizontal lines, due to the unequal weathering of the rocks, and has the appearance of a perpendicular wall. From the summit to the base, the slope is over 60° to the horizontal. Mr. McEvoy adds that, though the mountain had long been known, its height had never been determined nor was it thought to be conspicuously notable in elevation; but since the heights of Mounts Brown, Hooker, and Murchison have been proved to be greatly exaggerated, Mount Robson has the distinction of being the highest known peak in the Canadian Rockies.

FOREST RESERVES IN THE SOUTHERN APPALACHIAN AND WHITE MOUNTAINS.—The Council of the National Academy of Sciences has expressed itself in favour

of setting aside forest reserves among these mountains to protect the navigable streams which have their sources herein and to make permanent the timber supply of the eastern part of the United States, where no adequate means have been employed to protect the forests. The action of the Academy is in line with the recent recommendation of the Secretary of Agriculture that the Government acquire about 600,000 acres in the White Mountains and about 5,000,000 acres in the southern Appalachians for the establishment of national forests. The ultimate effects of carrying out the national policy relating to forest reserves, it is believed, will be the conservation, improvement, and increased use of the wood, water, and other resources of the Appalachian region.

THE QUEBEC TERCENTENARY.—The founding of Quebec by Samuel de Champlain in 1608 will be celebrated July 19–31, according to the following programme:

Sunday, July 19—"L'Association Catholique de la Jeunesse Canadienne Française" will do honour to the memory of Champlain at the foot of his statue.

Monday, July 20—Mounted Heralds-at-arms and Men-of-the-Watch will appear in the streets, costumed as in the time of Champlain. The Heralds will proceed through the city, stopping at all important places and will make official announcements in connection with the celebration, the arrival of official guests, the programme of the following day, etc. Arrival of the British fleet. Evening—The congress of the French-speaking physicians of North America will open.

Tuesday, July 21—Arrival and reception of official guests, and of the French and American fleets. Afternoon—Performance of the Pageant on the Plains of Abraham. Evening—Concert in the Drill Hall, and performance of Félicien David's Symphonic Ode, "Christophe Colomb."

Wednesday, July 22—H. R. H. the Prince of Wales will arrive in the afternoon escorted by a naval squadron, and will land at the King's wharf. Evening—Military bands at Dufferin Terrace, Victoria Park and Boulevard Langelier. Special meeting of tha Royal Society of Canada in honor of Champlain. Second performance of the symphonic ode, "Christophe Colomb."

Thursday, July 23—At 3 P.M.—Arrival of Champlain on his ship the *Don de Dieu*. At four o'clock: Presentation of the civic address of welcome to H. R. H. the Prince of Wales, and other official ceremonies, commemorative of Champlain and of the founding of Quebec. Review of the historic procession in front of the Champlain monument. Evening—Illumination of the combined fleets and of the surrounding country, and great display of fireworks on the Heights of Levis, opposite Quebec.

Friday, July 24—Morning—Review on the Plains of Abraham, before H. R. H. the Prince of Wales, and dedication of the Quebec battlefields. Afternoon—Performance of the Pageant on the Plains. Evening—Official ball at the Parliament House given by the government of the Province of Quebec.

Saturday, July 25—Afternoon—State performance of the Pageant of the Plains. Lacrosse match on the Q. A. A. A. grounds by two championship teams. Evening—Band concerts on the terrace, in the Victoria Park and at Boulevard Langelier. Concert de gala at the Drill Hall.

Sunday, July 26—"Messe Solennelle" on the Plains of Abraham. Service at the English Cathedral at which H. R. H. the Prince of Wales will be present.

Monday, July 27—Afternoon Regatta in the harbour in front of the city. Performance of the Pageant on the Plains. Evening—Naval display at night by the ships of the fleets in the port of Quebec.

Tuesday, July 28—Morning—H. R. H. the Prince of Wales will visit Victoria Park, and will plant a tree in commemoration of his visit. Afternoon—Children's fête and day fireworks on the plains. Naval and military gymkhana. Reception by His Honour the Lieutenant-Governor and Lady Jetté at Spencer Wood.

Wednesday, July 29—Departure of H. R. H. the Prince of Wales. Afternoon—Performance of the Pageant on the Plains. Children's fête and day fireworks at Victoria Park. Evening—Civic reception at the City Hall.

Thursday, July 30—Parade of national societies, and Canadian and other clubs and associations, as well as independent military guards, both Canadian and foreign. Evening—Great display of fireworks at Victoria Park.

Friday, July 31—Last performance of the Pageant on the Plains.

THE REBUILDING OF ST. PIERRE.—Many thought that the catastrophe which, on May 8, 1902, destroyed, in a few minutes, the flourishing city of St. Pierre and its 30,000 inhabitants, had permanently rendered the region around la Montagne Pelée uninhabitable. The history of Vesuvius, Etna, and other volcanoes is, however, to be repeated at Montagne Pelée. The extraordinary richness of the soil fertilized by volcanic *débris* was an attraction which the inhabitants who escaped the disaster were not able to resist. They have gradually returned to the mountain and rebuilt their huts right at Basse Pointe, Macouba, Grande Rivière, Prêcheur, Morne Rouge and Ajoupa-Bouillon. They complained, however, that Fort de France is too far away to be a convenient market and longed for the resurrection of St. Pierre, where they formerly sold their products and supplied their needs. Finally, a number of merchants established stores at St. Pierre in a small and tentative way and others have followed them.

On February 21 last, a merchant steamer of the Compagnie Transatlantique called at St. Pierre to unload freight. It was the first visit of the kind to the anchorage since the great disaster. About the same time Mr. Lepreux, Governor of the island, visited the settlement, where he was received by Mr. Ernoult, a member of the old municipal government and the only one whose fortunate absence from the city saved his life.

About 5,000 people are now living in the ruins of St. Pierre. They ask for the re-establishment of municipal government. Dwellings and stores are being erected and the colonial administration is helping to clear away the ruins. It is found that many of the paved streets are in a good state of preservation. As the *débris* is removed skeletons without number of the victims are brought to light. Along the shore and in the central part of the ruins Guinea grass has grown high and thick, and many cattle belonging to the farmers at Corbet have been thriving on these rich grazing grounds. (*Revue Française,* June, 1908, p. 381.)

PUBLICATIONS OF THE U. S. GEOLOGICAL SURVEY.—BULLETIN No. 325, "Geology and Mineral Resources of the Controller Bay Region, Alaska," by G. C. Martin, represents the geological and topographical results of the first detailed survey made of any of the Alaska coal fields. The Controller Bay region gives promise, in the immediate future, of being more important commercially than any other coal field in the Territory. It is about 400 miles northwest of Sitka and 15 miles east of the mouth of the Copper River. The areas believed to be underlain by workable coal are: Anthracite and semi-anthracite, 26.6 sq. m.; semi-bituminous (with some semi-anthracite), 22.2 sq. m. Numerous specimens of hard, firm, bright, and, apparently, pure coal, possessing all the physical characteristics of the best anthracite, have been seen in the upper part of the valley east of Carbon Mountain. Anthracite seams give thickness of a few inches or feet to 10, 12, 15 and 16 feet. Many samples of the coal have been tested in the government works at St. Louis, and from the analyses and tests it is concluded that the Bering River anthracite, Controller Bay, has no equivalent among the coals now being mined on the Pacific Coast, and that it compares favourably with Pennsylvania anthracite; and that the semi-bituminous is better than anything mined in the West. Part of this coal produces an excellent article of coke.

The extent of the areas of workable coal now known in Alaska is 1,238 square miles. The most important developments at present are in the Bering River region, Controller Bay, where all the most accessible coal lands have already been

located, about 20 tunnels are being dug, and the building of two railroads was begun in 1907. Actual mining operations, however, have been carried on chiefly at Cook Inlet, Alaska Peninsula, the Yukon, Seward Peninsula, and at Cape Lisburne, where local fuel is obtained for steamers, mining camps and canneries.

Vol. XLIX of the *Monographs* treats of "The Ceratopsia," a group of horned dinosaurs, remains of which were first discovered by Dr. F. V. Hayden in 1855 in the Judith River Badlands on the upper Missouri, in the present State of Montana. The preparation of the monograph was assigned to John Bell Hatcher, of whom Dr. H. F. Osborn says in his foreword to the volume: "His discovery and collection of these animals was, with the exception of his expedition in Patagonia, the greatest single achievement of his remarkable life."

He was engaged for two years in preparing the text and illustrations, but died in 1904 before the completion of his work. Prof. Richard S. Lull, of Yale University, has successfully finished the monograph, leaving Part 1, which is Mr. Hatcher's, just as he wrote it, with the addition of a few editorial notes in brackets. The quarto is illustrated with 51 large plates and numerous drawings in the text. One of the maps shows that the principal Ceratopsia localities are in Alberta, Canada, Montana, Southern Dakota, Wyoming, Colorado, and New Mexico.

THE LEWIS AND CLARK EXPEDITION.—The *Monthly Catalogue* of U. S. Public Documents (April, 1908) says that inquirers are much surprised when told that there is no Government report of this expedition. There probably would have been one had not the death of Lewis in 1809 interfered with President Jefferson's intentions. The Biddle-Allen narrative (2 v., 1814) carries on its title-page the words "by order of the Government of the U. S.," but it was, in fact, issued by private publishers, without Government subsidy, and the copyright was in the name of Captain Clark. These memoranda of the material in public documents are given:

Poore, p. 62. 9th Congress, 1st Session. Feb. 19, 1806. A message from President Jefferson, dated Fort Mandan, April, 1805. This letter and accompanying memorandum concerning certain Indian tribes are the only documents supplied by any member of the expedition and relating to its history that the Government has ever printed.

Poore, p. 67. 9th Congress, 2nd Session. Jan. 23, 1807. A letter from Henry Dearborn, Secretary of War, transmitting a communication from Captain Lewis giving his views as to the compensation above the ordinary pay that should be awarded to his men.

President Jefferson in his 6th Annual Message, Dec. 2, 1806, briefly commends the expedition.

Hayden's Survey, Bulletins, Vol. 1, No. 6. An account by Dr. Elliot Coues of the various editions of histories of the expedition issued up to 1876.

American Historical Association, Annual Report, 1903, Vol. 1. Story of Lewis and Clark's Journals, by R. G. Thwaites. This brings the record of publications nearer to date and tells of remarkable finds of unpublished material.

TREE PLANTING ON A LARGE SCALE.—The tree planting of the Pennsylvania Railroad for the season has been completed. About 315,000 trees, of which 200,000 were conifers and the remainder hardwoods, mostly red oak, were set out. Planting by the New York State Forest, Fish and Game Commission was also conducted on a large scale this spring. The planting was near Paul Smith's Ray Brook, and Lake Placid, in the Adirondacks, and included 540,000 two-year-old white pine seedlings, and 190,000 Scotch and 174,000 red pine two-year-old seedlings.—(*Forestry Quarterly*, Vol. 6, No. 2.)

METEOR CRATER.—Dr. George P. Merrill returned to Arizona several weeks ago. Last year he spent some time there in studying the peculiar crater-like depression in the plain, about three-quarters of a mile across and nearly 600 feet deep. His purpose in going back was to see the result of sinking new bore holes. A depth of 842 feet below the bottom of the depression was reached, and the results tended to confirm the conclusion which Dr. Merrill presented in his recent report of last year's investigations, that the crater was caused by a meteor.—(See BULLETIN for June, p. 354.)

ASIA.

THE RUSSIAN ARCTIC EXPEDITION OF 1905.—While the treaty of peace was being signed between Russia and Japan at Portsmouth in 1905, a Russian fleet of some fifteen vessels, loaded with railroad material and sent out by the Government, was making its way through the Kara Sea to the mouth of the Yenisei. The voyage was entirely successful and also the transportation of the freight up the Yenisei River to Yeniseisk, within about 200 miles of the Siberian Railroad.

In 1906 the Russian Ministry of Communications published a report (94 pp., 18 plates) giving a history of the voyage and the conclusions as to the prospects of opening a commercial highway by this route between Europe and northern Asia. Mr. Edouard Blanc has exhaustively summarized the report in the *Annales de Géographie* (May 15, 1908), and the conclusions deduced are presented here from his paper. .

Navigation across Barents Sea along the coast is always practicable during the summer season.

The passage of the Kara Sea is the difficult phase of the voyage. It was found, however, that the ice which encumbers it is neither old nor permanent. It is of annual formation. A large part of it is sweet-water ice. When the sea ice formed in winter begins to melt, the sea is invaded by an enormous quantity of ice coming from the Obi and Yenisei rivers and their affluents. This ice, augmented by the sea ice detached from the coasts and coming principally from the Gulf of Obi and Kara Bay, meets the barrier formed by Novaya Zemlia, and therefore cannot emerge from the Kara Sea, but accumulates and drifts around in it.

When the wind blows from the south or southwest, the ice moves to the northeast, opening a channel from Yugor Strait to the mouth of the Yenisei.

The report gives reasons for believing that when the south wind begins tardily the sea to the north of Novaya Zemlia is free of ice, and it is possible to reach the Yenisei by doubling the northern point of Novaya Zemlia. In other words, one of the two passages, either to the south or the north of Novaya Zemlia, always affords a passage in midsummer.

The bar of the Yenisei has seven meters of water over it. The principal obstacle to the navigation of the Yenisei is the rapids of Osinovskii. Mr. Blanc says that they are several hundred kilometers up the river, and, as the Russians have been studying them for two years past, he presumes that buoys have now been distributed along the channel. The fleet, in 1905, passed these rapids in 3.60 meters of water, but it was hazardous work. Excepting at these rapids there is no impediment to navigation from the sea to Yeniseisk, and we may say that maritime navigation extends from the sea to that town, a distance of 1,100 kilometers, with minimum depths of 20 to 22 feet, excepting at the rapids.

From Yeniseisk to Krasnoyarsk, where the Trans-Siberian Railroad crosses the Yenisei, navigation is easy, and boats drawing five meters are constantly navigating this part of the river in the summer months.

The official conclusion of the Ministry of Communications is that the two to two and a half months during which navigation of the Kara Sea is possible are sufficient for the development of commerce between western Europe and Siberia.

Russian Expedition to Kamtchatka.—According to a press report (*Scot. Geog. Mag.*, No. 6, 1908), M. T. P. Riabouchinsky organized at his own expense, with the co-operation of the Russian Geographical Society, a large and well-equipped expedition which left St. Petersburg early in May for Kamtchatka. The sections of the expedition are geographical, botanical, zoological, meteorological, and ethnographical, each complete in itself, with its own special programme. Some of the geologists will visit the whole eastern coast of Kamtchatka from Petropavlovsk northward to Baron Korfa Gulf, while others will make a detailed study of the central and unexplored volcanic region. The expedition numbers twenty scientific men, who will spend about eighteen months in the peninsula. The ethnographical section will first visit the Aleutian and Bering Islands, and will not reach Kamtchatka until the autumn of 1909. As a part of its work it will endeavour to discover traces of the oldest aborigines.

AUSTRALASIA.

Census of New Zealand in 1906.—The *Report* of this census, taken in the night of April 29, 1906, has been sent to the Society by the Registrar General, E. J. von Dadelszen. The population was 948,649, of whom 502,770 were males and 445,879 females. The population of the chief cities, including suburbs, was Auckland, 82,101; Wellington 63,807; Christchurch, 67,878; and Dunedin 56,020. There were 88.65 females to 100 males, the density of population was 8.541 to the square mile, and the dwelling houses numbered 197,003. Of the total population, 83.50 per cent. could read and write. The breadwinners numbered 399,085, of whom 75,244 were women. The industries with an annual output of over $5,000,000 each were meat-freezing works, butter and cheese factories, lumber mills, tanning and wool-scouring establishments, printing houses, and grain mills. The occupied lands embraced 37,408,473 acres, and there were 20,108,471 sheep, 3,191,604 poultry, 1,851,750 cattle, 342,608 horses, and 242,273 hogs. Tables in the supplement show five-years' progress of the colony.

POLAR.

Peary Starts again for the Arctic.—The *Roosevelt,* Mr. Peary's Arctic ship, with his party on board and supplies for about three years, left New York for the Arctic Ocean by way of the Smith Sound Channels on July 6. Commander Peary left the city a day later to rejoin his vessel on the Canadian coast. His scientific assistants are Ross C. Marvin of the Department of Civil Engineering in Cornell University, D. D. McMillan of Worcester, Mass., and George Borup of Yale University. The Peary Arctic Club invited a considerable number of persons to see the expedition off, and the guests remained on the vessel until she had proceeded some way down Long Island Sound. The party is believed to be

thoroughly equipped for another arduous Arctic campaign. As is well known, the purpose of Mr. Peary is to make another attempt to reach the north pole by sledge, starting from the most advantageous base he is able to secure on the coast of Grant Land.

THE BRITISH ANTARCTIC EXPEDITION.—The *Scottish Geographical Magazine* (No. 6, 1908) gives further interesting details of the progress of this expedition, derived from private letters from various members of the staff. The Great Ice Barrier was sighted on January 23, and its height at the point reached was found to be 120 feet. Professor David tells of the beauty of this gigantic wall of ice, with its bright blue crevasses, some of which are of remarkable shape, being narrow above and below, but gaping widely in the middle. The crevasses began at about 30 feet below the summit of the ice wall, had a vertical height of about 15 to 20 feet, and thus died away at about 50 feet below the top of the Barrier. They seemed to intersect the edge of the Barrier obliquely. Thus, while the Barrier edge ran nearly east and west of this point, these peculiar crevasses ran about WSW. and NNE.

It was intended to land at Balloon Inlet, where Captain Scott made a balloon ascent to a height of 700 feet in 1901. While steaming towards this point, the party saw low, rounded hills covered with ice and snow at a distance of 10 to 12 miles from the Barrier. The height was estimated at about 800 feet above sea level, and the region was close to where Ross marked "appearance of land." The fact that this land was not seen by the party in the *Discovery* was no doubt due to the thick weather which prevailed when the ship was in that region. The Barrier here was fringed by bay ice, which was swarming with animal life, including emperor penguins, Weddell seals, petrels, skuas, and fin-backed and killer whales. What had been Balloon Inlet was now represented by a large bay, at the head of which was a remarkable undulation of the Barrier, bringing the snow surface down to sea level. The Barrier had receded 11 miles at the point where Balloon Inlet was formerly placed, owing, doubtless, to the breaking off of the great mass of ice in that place. Two attempts were made to reach King Edward VII Land, but although the ship came within forty miles of the island, impenetrable pack prevented further progress. As no possible landing place existed on the Barrier, it was reluctantly decided to run to the *Discovery's* old winter quarters in M'Murdo Sound, where the sledge party was landed just south of Cape Royds. On January 31, during the landing preparations, a sad crane accident occurred, which injured Mr. Mackintosh, the second officer, depriving him of the use of one eye. The accident took place while a heavy package was being hoisted from the hold.

FRENCH EXPEDITION TO BARENTS AND KARA SEAS.—An expedition has been sent under the command of Captain Bénard, President of the Oceanographical Society of Bordeaux, to investigate the possibility of establishing profitable fisheries in Barents Sea and also to engage in oceanographical work. A ship has been built for the expedition at Dunkirk, christened *Jacques Cartier,* and specially strengthened to resist ice pressure. It is known that the continental shelf, furrowed by some submarine fiords, extends under Barents Sea, and it is conjectured that in some of the shallower waters rich fisheries may be found. The scientific staff will include a mining engineer for geological and mineralogical work, a naval

officer for astronomical, hydrographical, and magnetic observations; another, in charge of meteorology and geophysics; a chemist, and a biologist.

Among the investigations on land will be a study of the mineral resources of the Novaya Zemlia Mountains, which are thought to be a continuation of the Urals and may contain rich mineral deposits. The coast will also be searched for suitable harbours, the flora will be investigated, and a house erected near Matochkin Shar, the strait between the northern and southern islands, as a permanent headquarters for scientific studies. It is expected that time will permit the doubling of the northern Cape of Novaya Zemlia for studies in the Kara Sea.

VARIOUS.

With a view to attracting tourists to the Philippines, the Manila Merchants' Association has published a small illustrated volume entitled "Manila, the Pearl of the Orient." It has a sketch map of the Philippines and black-and-white plans of Manila and the walled city.

The "Livret des Excursions Scientifiques" of the Ninth International Geographical Congress contains lists of the excursions, the literature and maps relating to the various regions, a summary in geology, and the cost of the excursions. A number of geological profiles are given. The book may be obtained from Prof. E. Chaix, Avenue du Mail, 23, Geneva, for 1.50 fr. The time for enrolling names expired on June 1 for excursions preceding the Congress and on July 1 for those following it.

The British Association, which will meet in Winnipeg next summer, has courteously invited all members of the American Association to become members for the meeting.

The officers of the American Association are planning an excursion to Hawaii and a meeting there in the summer of 1909.

Dr. J. Walter Fewkes has gone to the Mesa Verde National Park, Mancos, Colorado, to take charge of the excavation and preservation of the cliff dwellings there. *Science* says that the Cliff Palace at this place is the finest and largest example of cliff-house architecture in our Southwest:

> In the Cliff Palace, Dr. Fewkes plans to excavate all the rooms and plazas to their floors, remove accumulated *débris*, repair the walls that are in danger of falling, and put the ruin in such a condition that a visitor may walk through the courts and rooms without obstruction.

THE PEDAGOGY OF GEOGRAPHY.—Dr. David Gibbs has contributed to the cause of geographic education an extremely interesting and suggestive dissertation on the pedagogy of geography, originally prepared as a doctorate thesis in Clark University, and published in the Pedagogical Seminary for March, 1907. The thesis includes a brief historical review of geographical text-books, a similar review of methods of teaching, a summary of the present status of geography in Europe, a treatment of geography in the high schools of the United States, of geography in the normal schools, in technical schools, in colleges and universities, in elementary schools, a brief consideration of the value of geography and a bibliography. The

larger part of the dissertation is devoted to the much-discussed field of geography for elementary schools. The author studied the courses of study in twenty-one cities of the Union, and endeavoured to find out by means of a *questionnaire* the opinions of teachers as to the best course of study. He also studied the matter of children's supposed interest in different phases of geography—the results in this field being of relatively less value, because children's interests are largely determined by many external conditions not pertinent to the subject in hand.

As a result of these several lines of inquiry, the author arrives at the following conclusions concerning what elementary school geography should be:

Summary. The following is a general outline of the arrangement of materials as suggested by the foregoing studies:

Grades I, II and III. Nature study, with observation of plants, animals, minerals, weather, rain, clouds, dew, frost, snow, some of the effects of heat and cold on life of animals and plants, etc.

Observation of occupations, local means of travel, some of the local products, and foreign articles of the child's personal needs and comforts.

Stories of children, people, and animals in other countries in contrast with the personal experiences of the child.

Grade IV. Continuation of the out-of-door observation and nature study of the former grades, with the beginning of map representation of the facts observed, of streets, hills, streams and the town, the surrounding district, the locating of facts connected with nature study and local history. Some idea of the globe and the condition of the continents, derived mainly from the continued reading of peoples' primitive life, with more emphasis upon their occupations, food, customs, and homes.

Grades V and VI. The work up to these grades should be mainly supplementary to reading and nature study. It should include a general study of land and water forms and their representation on maps, map studies of the various continents and countries, including locations, comparisons of as many important facts as can be represented by clear graphic methods, the learning of the important cities, countries, rivers, mountains, products, in connection with map study, and the reading of general detailed descriptions of the various countries and of various important topics, of travels, voyages, and discoveries.

Grade VII. Review of the facts learned by observation and description, reading and map study in large units, and causal relations, the elements of physical and commercial geography and meteorology, with an outline of the anthropological development.

Grade VIII. The outlines of general history, the general history of the earth, including plant and animal development, and some of the more important topics of the natural sciences.

Mr. J. G. Bartholomew, the well-known map publisher of Edinburgh, has been appointed a corresponding member of the Imperial Russian Geographical Society.

The Geographic Board of Canada has named the cañon below the Grand Falls of the Hamilton River in Labrador "McLean," in honour of John McLean, an agent of the Hudson Bay Company, who discovered the falls and cañon in 1839 and gave a vivid description of them in his book, entitled "Notes of Twenty-

five Years' Service in the Hudson's Bay Territory." These are the falls that were later visited and described by Mr. H. G. Bryant of Philadelphia.

The *Geographical Journal* (June, 1908) says that the Court of Glasgow University has decided to establish a lectureship in geography; also, that Mr. H. O. Beckit of Balliol College has been appointed assistant to the Reader in Geography at Oxford for the year 1908-9. These facts are further evidence of the interest which geography is now attracting in British educational circles.

The Karl Ritter gold medal of the Berlin Geographical Society has been conferred on Professor Hermann Wagner of Göttingen.

FINE MAPS AT RAILROAD STATIONS.—Consul J. Perry Worden writes from Bristol, England, that the Midland Railroad of that country has framed and hung in its stations the ordnance maps of the neighbouring districts on a scale of a mile to an inch. The maps are of the contour series, so that intelligent travellers may locate the surface features on their route. In most cases a note on the map indicates the exact height above sea level of each railroad station. The maps are attracting much attention, as they are not only serviceable to persons travelling by rail, but are often of equal value to bicyclists and even to pedestrians.

OBITUARY.

PROF. DR. LUDWIG SCHMARDA.—This well-known zoologist has died in Vienna, aged nearly 89 years. He was a great traveller and an authority on biogeography. His most important works were: "Die geographische Verbreitung der Tiere" (1853) and "Reise um die Erde" (1861). The latter production, published in three volumes, is regarded as one of the best works of travel description.

DR. KARL MARTIN.—This distinguished geographer died at Puerto Montt, Chile, in October, 1907. A German by birth and education, he made Chile his second home, and only shortly before his death he published his great work "Landeskunde von Chile," the result of many years of study of that land and its inhabitants. His scientific researches and writings were of the highest quality.

CARL CHRISTIAN KOLDEWEY.—Captain Koldewey died on May 17th in Hamburg, where he had long been connected with the German Hydrographic Office. He was best known as the commander of the German Arctic expedition to the East Greenland Sea, which sailed from Bremen in the *Germania* and *Hansa* in 1869. The *Hansa* became separated from her consort, was crushed in the ice, and the castaways drifted on the floe through the winter for 1,100 miles, enduring great hardships, but finally reaching the southwest coast of Greenland. Fairer fortune attended the steamer *Germania* and her sledge parties. Cape Bismarck marked the northern limit of Koldewey's important discoveries, and Franz Josef Fiord, with its high Petermann and Payer peaks, was revealed by this party. The results of the expedition were published both in German and English.

NEW MAPS.

AFRICA.

CAPE OF GOOD HOPE.—Geological Map of the Colony of the Cape of Good Hope. Scale, 1:238,000, or 3.7 statute miles to an inch. Geology by A. W. Rogers. Sheets, 49 (Kuruman) and 50 (Vryburg). Geological Commission, Cape Town, 1908.

Both sheets have sections showing the geological formations along lines drawn on the maps, with vertical scale five times the horizontal. The two sheets embrace the area 22° 45′ to 25° 15′ E. and 26° 30′ to 27° 40′ S. The most conspicuous feature is the broad band of the Campbell Rand series extending east and west over about half the area, the rocks being dolomites, limestones, cherts, and shales.

EGYPT.—First or Aswan Cataract of the Nile. Scale, 1:20,000, or 0.3 statute mile to an inch. Supplement to "A Description of the First or Aswan Cataract of the Nile" by John Ball. Survey Department, Egypt, Cairo, 1907.

EGYPT.—Geological Map of the First or Aswan Cataract. Supplement and scale as above. Survey Department, Egypt, Cairo, 1907.

The first of these excellent maps shows the topographic survey of this district used as a base upon which to impose the geological data on the second sheet. So complicated an area (including a large number of small islands) could only be mapped with a network of small triangles as a foundation. The new reservoir dam (length 1,966.43 meters) made an excellent base line. Nearly all the archæological remains were precisely located, and thus the map will render service to archæologists.

The principal rock is the well-known red syenitic granite. There are also other igneous rocks, including a series of older gneisses and schists, with dikes of granite, pegmatite, porphyrite, basalt, and others permeating the mass in various directions. The geological map shows the influence of these dike-rocks in determining the position of the river channels. The cataract islands are almost entirely formed of igneous rocks, but the deserts on either side are overlain by the Nubian sandstones and clays, deposited long after the forces which crushed the underlying rocks had ceased to act. The igneous rocks are therefore far older than the Cretaceous period.

THE GOLD COAST.—Gold Coast. Scale, 1:125,000, or 1.9 statute miles to an inch. Published under the direction of Major F. G. Guggisberg, Director of Surveys, Gold Coast. Sheets, Adeambra, 72 J. II; Asankrangwa, 72 P. II; Denu, 73 H. III; W. & A. K. Johnston, London, 1908. (Price, per sheet, 2s.)

Major Guggisberg is rapidly advancing his surveys in this colony, and the resulting map sheets supply much new information concerning its geography.

SUDAN.—Frontière entre le Congo Français et le Cameroun. Convention du 18 Avril 1908. Scale, about 93 statute miles to an inch. *Bull.* du Com. de l'Afrique française, No. 5, 1908, Paris.

Illustrates the full text of the convention between France and Germany. Shows the lands acquired by and ceded to France, commercial routes, and regions where the tsetse fly was met during the survey.

XUM

ORAN AND MOROCCO.—Carte schématique du Sud Ouest Oranais. Dressée par Lieut. Coste. Scale, 31 statute miles to an inch. *Bull.* du Com. de l'Afrique française, No. 5, 1908, Paris.

The region in southwestern Oran and southeastern Morocco where hostilities between the French and the Moroccans have recently occurred. Lieut Coste was killed in a fight with the enemy on April 16, 1908, a few days after completing this map.

AMERICA.

HYDROGRAPHIC OFFICE CHARTS.

Pilot Chart of the North Pacific Ocean. July, 1908.

UNITED STATES.—Map of Alaska. Scale, about 200 statute miles to an inch. Supplement to "Smithsonian Exploration in Alaska in 1907 in Search of Pleistocene Fossil Vertebrates." By Charles W. Gilmore, Smithsonian Institution, Washington, 1908.

Shows the distribution of mastodon remains, deposits of Pleistocene mammals and routes travelled by Maddren in 1904 and Gilmore in 1907.

UNITED STATES.—(1) Topographic Map of Controller Bay Region, Alaska. Scale, 1:62,500, or 0.9 statute mile to an inch. 60° to 60° 30′ N.; 143° 45′ to 144° 40′ W.

(2) Geological Map and Sections of Controller Bay Region, Alaska. Scale, 1:62,500, or 0.9 statute mile to an inch. By G. C. Martin, assisted by A. J. Maddren, Sydney Paige, and C. E. Weaver. Contour interval 50 feet. U. S. Geological Survey, Washington, 1908.

These topographic and geological sheets, of the same size and scale, result from the first detail survey (1905) of any of the coal areas in the territory. They supplement *Bull.* No. 335, "Geology and Mineral Resources of the Controller Bay Region, Alaska."

UNITED STATES.—The following maps (in pocket) supplement *Bull.* No. 328 of the U. S. Geol. Survey, "The Gold Placers of Parts of Seward Peninsula, Alaska." Scale, 1:250,000, or 3.95 statute miles to an inch:

(*a.*) Reconnaissance Map of the Northwestern Part of Seward Peninsula, Alaska. 65° to 66° 40′ N.; 163° to 168° 20′ W.

(*b.*) Topographic Reconnaissance Map of the Southern Part of the Seward Peninsula. 64° 20′ to 65° 30′ N.; 162° 40′ to 167° W.

(*c.*) Geologic Reconnaissance Map of the Northwestern Part of Seward Peninsula. Same area as in *a.*

(*d.*) Geologic Reconnaissance Map of the Southern Part of Seward Peninsula. Same area as in *b.*

The topographic maps are contoured with 200 feet interval. On the geologic map is indicated the distribution of the unconsolidated silts, sands, and gravels, under the general group named Quaternary.

UNITED STATES.—Soil Map of Conway County, Arkansas. Scale, 1:63,360, or 1 statute mile to an inch. Bureau of Soils. U. S. Dept. of Agric., Washington, 1908.

Supplements a description of the soils of Conway County by J. L. Burgess and Charles W. Ely.

CANADA.—Among the maps illustrating the annual Report of the Geological Survey of Canada for 1904 are the following:

Sketch Map Showing Explorations from Lac Seul to Severn Lake, Keewatin. Scale, 34 statute miles to an inch. Supplements the report by Charles Camsell on the "Country Around the Headwaters of the Severn River." The hydrography is in blue. Mr. Camsell found that what was considered to be the main branch of the Severn River is not so large as the Cedar River branch.

Map of the West Coast of James Bay. Scale, 16 statute miles to an inch. A supplement to O. O'Sullivan's Report on his survey and exploration of the west coast of James Bay. Mr. A. P. Low's map of the east coast of Hudson and James Bays has been noticed in the BULLETIN (1904, p. 765). Elevated beaches and other evidences, Mr. O'Sullivan says, are proof that the coast of James Bay is slowly rising.

(A.) Geological Map of Graham Island, Queen Charlotte Group, British Columbia. (B.) Geological Map of Graham Island Coal Field. Scales, map A, approximately, 4 miles to an inch, and B, 80 chains to an inch. Illustrates the report by R. W. Ells on Graham Island, the most northerly of the Queen Charlotte group on the Pacific Coast. Particular attention is given to the coal areas of the interior, which were discovered twenty-two years ago.

Geological and Topographical Reconnaissance Map of the Upper Stewart River Region, Yukon Territory. Scale, 8 statute miles to an inch. The Stewart River, one of the principal tributaries of the Yukon, drains an extensive region, and was one of the first rivers in the Yukon Territory to attract the attention of gold miners. J. Keele reported on its upper waters and his map is based upon his own surveys.

Map of the Peel and Wind Rivers, Yukon Territory. Scale, 8 statute miles to an inch. A map in colours, printing geological information in red, and botanical data in black type. It supplements C. Camsell's Report on his geological and topographical reconnaissance of the Peel River in the extreme northwestern part of the Dominion in 1905.

AUSTRALASIA.

AUSTRALASIA.—Stanford's New Orographical Map of Australasia. Scale, 1:5,385,600, or 85 statute miles to an inch. Compiled under the direction of H. J. Mackinder. 58 by 50 inches. Edward Stanford, London, 1908. (Price, sheets, 16s.; mounted, 20s.)

This is the last of the fine series of seven school wall maps of the continents and Palestine which have, from time to time, been noticed in the BULLETIN. The series is an admirable contribution to the cartographic appliances used in schools. The present map fully equals its predecessors in the large amount of information scientifically collated and brought to date. A distinguishing feature is that all of the marked saliences of the land forms and ocean floors are clearly and carefully emphasized. Every student, for example, who studies this map and its explanatory text cannot fail to notice the extraordinary concavity formed by the abyss of the Banda Sea which descends to depths of approximately four miles. The care with which all the latest data are introduced has many examples, as, for instance,

the new submarine cable to Guam where it connects with the line to San Francisco. The nomenclature is clearly printed, though sometimes a few names are obscure in the darkest tints.

QUEENSLAND.—General Map of Ipswich Coal Field. Scale, 1:63,360, or 1 statute mile to an inch. Geological Survey Office, Brisbane, Queensland, 1907.

QUEENSLAND.—Geological Map of the Bundamba District, West Moreton Coal Field. Scale, 10 chains to an inch. Heights in feet. Two sheets. Geological Survey of Queensland, Brisbane, 1906.

These maps in colours supplement publication No. 204, the second *Report* on the West Moreton (Ipswich) Coal Field by Walter E. Cameron, Assistant Government Geologist. This is at present the chief producing coal field of the State, turning out more than 75 per cent. of the total production. The outcrops of the seams and their accompanying beds of sandstone and shale are shown, together with the positions of the main workings.

DUTCH NEW GUINEA.—H. A. Lorentz' Expedition nach dem südwestlichen Neu-Guinea, 1907. Scale, 1:3,000,000, or 47.34 statute miles to an inch. Supplements an article by H. Wichmann on Lorentz's expedition. *Pet. Mitt.*, Vol. 54, No. 4, Gotha, 1908.

A coloured map showing new discoveries of the Dutch in the southeastern part of Dutch New Guinea and especially the Digoel and Noord Rivers and Wilhelmina Peak, the recently discovered snow mountain.

EUROPE.

GERMANY.—Haustypen-Gebiete im Deutschen Reiche. Scale, 1:2,500,000, or 39.4 statute miles to an inch. By Dr. Willi Pessler. *Deutsche Erde*, Vol. 7, No. 2, Justus Perthes, Gotha, 1908.

Supplements the article of the same name, an ethno-geographical investigation by Dr. Pessler. The colours show the prevailing type of dwellings in the various regions of Germany.

GREAT BRITAIN.—Map of the Canal Systems and Navigable Rivers of England and Wales. Scale, 1:643,000, or 10 statute miles to an inch. Plate, No. 5, in two sheets, with 5 pp. index. Royal Commission on Canals and Waterways, London, 1908.

This plate is supplementary to the four plates reviewed in the BULLETIN for May (p. 300). It shows the canals and navigable rivers of England and Wales arranged according to their control by railways or independent authorities. Their carrying capacity is indicated by the thickness of the lines on the map.

NORWAY.—Topografisk Kart over Kongeriget Norge. Scale, 1:100,000, or 1.5 statute miles to an inch. Sheets: Lödingen, 9 L; Kaafjord, 5 T. Norwegian Geographical Institute, Christiania. (Price, kr. 0.60 a sheet.)

Perhaps the clearness of these sheets of the partly new and partly revised map of Norway, which the Geographical Institute is now issuing, would be improved if the streams were shown in blue as the standing waters are, and thus more sharply differentiated from the contour lines.

NORWAY.—Kristiania Omegn. Plate IV. Scale, 1:25,000, or 0.3 statute mile to an inch. Norwegian Geographical Institute, Christiania, 1908. (Price, Kr. 0.60.)

The contour interval is 10 meters. Light and shade as well as contours are used in the expression of relief. On a scale so large the street plan of Christiania is clearly printed. The depths of the harbour and its approaches are in meters.

WORLD.

WORLD.—George Philip & Son, Ltd., of London, have issued, as a separate, 4 new sheets of maps prepared for their New Imperial Atlas. The sheets include "The World, Showing Physical Features" (in hemispheres), 6 tints being used to represent heights in feet and the same number of colours showing ocean depths in feet and fathoms. The registration of colours is perfect, and so excellent a generalization of the elevations and depressions of the lithosphere has rarely been produced on a small scale. The results of ocean soundings include the southern extension of the Atlantic submarine ridge as discovered by the *Scotia*, but the deep troughs quite recently traced by the German survey vessel *Planet* in the Indian Ocean and along the east coast of the Philippines do not yet appear in any of the atlases. Six sections around the earth at the equator and on various parallels from 60° N. to 45° S. are given with the vertical scale exaggerated one-hundred-fold.

Five maps give in colours the main climatic data of the world, and with them is a map of the regional distribution of vegetation, so that the effects of climates upon the quality and distribution of vegetable growths are graphically illustrated. One sheet also contains two large atlas maps of the Arctic and Antarctic regions on a scale of 1:35,000,000, with insets on a scale of 1:10,000,000, of the Smith Sound Channel, Franz Josef Land, Spitzbergen, Victoria Land, and Graham Land. Tundra is shown in brown, and the permanently open sea limits of drift ice and unexplored regions are indicated.

These are admirable charts giving the latest data. Peary Land should have been marked on the northern inland parts of Greenland, for his name, years ago, was fittingly attached to this region, in honour of his pioneer journeys across it. The maps are fine specimens of artistic cartography controlled by scientific geographical supervision. Their price in sheet form is 2s, 6d.

ACCESSIONS TO THE LIBRARY.

APRIL–JUNE, 1908.

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BLUNT, WILFRID SCAWEN.—Secret History of the English Occupation of Egypt. Being a Personal Narrative of Events. (Frontispiece.) London, T. Fisher Unwin. 1907. 8vo.

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EGYPT and How to See It. Illustrated by A. O. Lamplough. New York, Doubleday, Page & Co. (1907.) 16mo.

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MÉTIN, ALBERT.—La Colombie Britannique. Étude sur la colonisation au Canada. Avec vingt cartes et cartons et trente-trois phototypies hors texte. Paris, Armand Colin. 1908. 8vo.

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WEINTZ, H. J.—Japanese Grammar Self-Taught. (In Roman Character.) Second Edition. London, E. Marlborough & Co. 1907. 16mo.

WELTREISE. MEYERS REISEBÜCHER. Mit 27 Plänen und 1 Flaggentafel. Leipzig und Wien, Bibliographisches Institut. 1907. 16mo.

Noms géographiques de la Province de Québec et des Provinces Maritimes, empruntés aux langues sauvages. Avec carte indiquant les territoires occupés autrefois par les races aborigènes, Etymologie, traduction et orthographe, Par Eugène Rouillard. Ed. Marcotte, Québec, 1906.

To the majority of general readers, etymologizing of names, particularly of local ones derived from Indian tongues, appears little more than a work of harmless curiosity. And yet, valuable information can be derived, and is, for history and principally for ethnography. But it is a delicate field to tread, one in which enthusiasm may lead us dangerously astray. The author is conscious of that danger, and dissertations of his like those on the names: *Acadie, Canada, Gaspé, Québec,* which we select as most generally familiar, show that he feels his way quite carefully through the maze of aboriginal and European words that have entered into the composition of local Canadian names. The map of distribution of the Indians over New France is a fair outline sketch.

It strikes us that Mr. Rouillard might have done well to pay some attention to the earliest Spanish, Portuguese and, in connection with them, Italian (for instance, Ramusio) literature as far as it concerns the subsequent French possessions in North America. These sources, not to forget Peter Martyr, preserve some of the local names as they were first heard. Of course, they may be misunderstandings in that they applied to something else than places and regions, and they certainly are, even if properly applied, much misspelled, but they are the earliest terms heard,and they should be taken into account when the geographical vocabulary of the region is discussed. In regard to tribes represented both in Canada and in the United States, authors like Adair, Morgan and Hale would, it is likely, have been of some service to the author, especially where very important stocks like the Iroquois are referred to. A. F. B.

Man and Earth.—The Reciprocal Relations and Influences of Man and His Environment. By Alfred Kirchhoff. Translated by A. Sonnenschein. vii and 223 pp. George Routledge & Sons, London, and E. P. Dutton & Co., New York. (Price, 1s.)

This little book is a translation of Prof. Kirchhoff's "Mensch und Erde" which has become very popular in Germany. It is an able and brilliant description of the features of some parts of the world and of their influence on the spread of civilization. The excellent English translation, made into a book adapted for the pocket, will be heartily welcomed. An introductory chapter sets forth the interaction between man and his geographical environment and draws the conclusion that in the present state of our knowledge we cannot doubt that the power exercised by our planet over the human race is greater than that of the race over the planet.

The topics of the other chapters are the influence of the sea in the life of nations, the peoples of the steppes and deserts, the influence of man on the landscape, the British Isles and Britons, America and the Americans, Germany and the Germans, and China and the Chinese. The chapter on America is supplied by Professor Sonnenschein, the translator, who has also written a considerable number of foot-notes.

The book is crowded with illustrations of the relations between man and geography, and we know of no source from which teachers can draw more edifying and interesting material for the class room relating to those phases of geography with which this little volume deals. Professor Kirchhoff is not only a storehouse of facts, but his gift of imagination cements the material he uses into a finished scientific and literary product, which is as interesting as it is instructive to all intelligent readers.

Die Städte geographisch betrachtet. Von Professor Dr. Kurt Hassert. vi and 137 pp., 21 Illustrations. B. G. Teubner, Leipzig, 1907. (Price, M. 1.)

Dr. Hassert, Professor of Geography at the Commercial High School in Cologne, is widely known as an authority on economic geography. This book is an expansion of four lectures delivered in October, 1906, on the development of cities and the influences that shape and characterize them. It treats of the causes that lead to aggregations of people in towns and cities, the height above the sea level of such settlements (most cities being built on plains or lowlands), the industrial and commercial types of cities, relation of cities to the land trade routes, the growth of cities and development of the metropolis, relation between urban population and the number of dwellings, the separation of the residence and business quarters, building material, street names, etc. The book is the outcome of a close study of urban development in all times. It abounds with curious as well as pregnant information and is to be commended as a bit of geographical literature that is very readable and also contributes to our general knowledge of one of the greatest of social factors.

Les Lacs Alpins Suisses. Étude Chimique et Physique. Par le Dr. Félix-Ernest Bourcart. Georg et Cie., Genève, 1906.

Thirty-three small alpine lakes, ranging in altitude from 643 meters (Amsoldingen, Bern) to 2,388 m. (Schotten, Grisons) are in this volume illustrated by beautiful photographic vignettes, described according to their physical and chemical properties.

The author says—"Basing upon the nature of the basin of supply (alimentation) in comparison with the waters of each lake, we succeed in grouping them so as to obtain a rational classification of all alpine lakes." Although the lakes examined by the author are not "all" those of the Swiss Alps, we abide by the author's classification into two main groups, one, where the chemical basis of the soil is silicious, and the other, where it is calcareous. Of the former he enumerates 15, of the latter 18. These two groups are again subdivided according to the size of the supply basins.

The researches seem to have been made with the greatest possible care and precision. The physical conditions were studied *in situ*, the surrounding topography carefully observed and noted, the nature of the soil to a certain distance above the lake and the composition of rocks determined; the temperature of the air, of the water, at surface and greatest depth, its transparency and colour noted, and the same researches were practiced in a measure in regard to supply basins, affluents, and springs, in cases where the latter were feeders of the lake. The depths observed vary between m. 4 and m. 83.6, and it is to be regretted that in the case of the latter the temperature at the bottom could not be ascertained. In the case of Lake Silvaplana the difference of temperature between surface and bottom (m. 77) was 5 degrees centigrade.

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Profuse analyses are given in tabular form. They reveal the presence of a number of inorganic substances, chiefly silicates, alkalis, magnesia, aluminium, lime, iron, manganese, sulphuric acid, oxygen, chloride, carbonic acid, etc. Oxygen and carbonic acid are absorbed from the atmosphere. On the whole, the solid matter is, naturally, more abundantly contained towards the bottom than on the surface, owing to the constant renewal of the water above through rain in the summer and snow and ice in the winter, which renewal affects but little the lower strata. Neither is there any considerable difference between the chemical composition of the waters of lakes and that of their immediate affluents.

We cannot follow the author in the minute details into which he enters regarding every particular lake. The whole is a most careful and conscientious study made with the assistance of the most perfect modern appliances, and if this valuable report appears to be more suggestive than conclusive this is due to the caution which thorough study of the subject calls for in the author. A. F. B.

Popular Poetry of the Baloches. By M. Longworth Dames, M.R.A.S. Two volumes in one. Pp. xxxix, 204, and 224. David Nutt, London, 1907.

One gray winter day beside a saline stream in the gravel-plains on the western border of Afghanistan the reviewer saw a nomad seated writing in the door of his low tent of dark-brown haircloth. "He is a great man, a poet," said the attendants. Two weeks later at Seyistan a Baluchi minstrel appeared carrying a crude violin. As he played upon its untuned strings, he chanted monotonous ballads learned from the mouth of poets like the one seen in the tent, or, perchance, handed down for centuries. Everywhere in Baluchistan such minstrels, or "doms," are found. Mr. Dames has collected a great number of ballads and other poems from them and gives us both the text and the translation in a volume published jointly by the Royal Asiatic Society and the Folk-Lore Society. The translations appear to be well made. They are not metrical, however, and therefore fail to give the true impression of the original. Most of the poems are from the tribes living in the northeast corner of Baluchistan near the Indus Valley. They relate in part to a thirty-years' struggle between rival tribes in the early part of the 16th century, and in part to later events. Many were written at the time of the events described, and are the work of the chiefs who actually performed the deeds which are commemorated. In addition to the historical poems, there are a number of romantic ballads, religious poems, and love songs, as well as a few pages of cradle songs and riddles. Rhyme is rare in the earlier ballads, but becomes more common in those written within the last two centuries. The poetic form is distinctly Baluchi. Dames finds many traces of Indian and Persian influence in the historic and amatory poems, and of Arabic influence in the religious compositions; but, on the whole, Baluchi literature appears to be indigenous. "As in form, so in substance," says Dames, "Balochi poetry is simple and direct in expression, and excels in vivid pictures of life and country, which it brings before us without any effort at description on the part of the singer. As might be expected in a parched-up land where water is scarce and rain seldom falls, the poets delight in describing the vivid thunder storms which occasionally visit the mountains and the sudden transformation of the country side which follows a fall of rain. The heavy atmosphere laden with dust and haze is transformed into one of transparent clearness and inspiriting freshness." For example, in the poem of Dosten and Shiren, a pretty ballad of faithful lovers, we read, "The storm-clouds have rained upon Konar, on the

plains and slopes of Mungachar, on the sweet-smelling hills of Sani. The pools are filled to overflowing, the water trembles like the gwan-leaves (the wild pistachio), the waves bend like the jointed sugar-cane. The graziers have made ready for the march, the owners of sheep and goats, the shepherds, Sahaks's sons. The women have tied up their baggage, the camel men have adjusted their loads." Most of the poems are full of the life of nomads; and, as is natural among such people, cattle-lifting raids are the cause of most of the warlike incidents described in the poems. Mr. Dames' book is not one that appeals to a large number of readers, but to the student of folk-lore and one who would understand the spirit of nomads it is of great value. E. H.

Folk Tales from Tibet, with Illustrations by a Tibetan Artist and Some Verses from Tibetan Love-Songs. Collected and Translated by Capt. W. F. Connor, C.I.E. viii, 176, 1 Photogravure and 12 Coloured Plates. London, Hurst & Blackett, 1906.

Captain Connor spent two years in Tibet, at Gyantse, Lhasa, and elsewhere, serving part of the time as secretary and interpreter of Colonel Younghusband's political Mission to Lhasa. He succeeded to an extraordinary degree in winning the confidence of the Tibetans, who naturally were not disposed to be communicative to armed invaders. "But," as he says in the preface to his book, "patience, and the growth of kindly feelngs on both sides, helped me to some extent to overcome the shyness and reluctance of the simple folks who have supplied me with my material; and, as time went on, I was able to coax a story from many unlikely sources. Village headmen, monks, servants, local government officials, peasants, traders—these and many others have contributed to my store. Shyly and haltingly at starting, with many bashful apologies and disclaimers, the story-teller will begin his tale. But a Tibetan audience is one of the best imaginable, and their open sympathy and appreciation soon melt the frosts of reserve, and the words flow freely. Presently all sense of constraint is lost, and I have known a story interrupted for ten minutes at a time by the uncontrollable merriment aroused by some comic incident." This quotation and the tales which follow it admirably illustrate the child-like simplicity and good-humour of the unsophisticated Tibetan in spite of what are usually deemed unpropitious surroundings. The Tibetans are gross, too, but Capt. Connor has omitted stories dealing with this side of their character. The tales have been translated very simply, with no attempt at rhetorical effect. The happy result is that the reader is tempted to read tale after tale. Of course the chief interest is ethnographic, but there is a geographic basis for each story. The sheep, goat, wolf, hare, frog, crow and wild ass figure as distinctly Tibetan animals, while the lion, tiger, monkey and serpent have been imported from India. In many of the tales one feels a strong local flavour. For instance, number seven, where the hare—always clever—helps the wild ass to outwit and shake the wolf and fox; brings to mind the broad, treeless uplands—grassy in the flat, open valleys, but bare and sterile where low rounded mountains rise above the limit of vegetation. Again, where else in all the world outside the lofty treeless plateau of Central Asia would it be said that armies of mice agreed to help the king if he would furnish them with cakes of dried yak's dung—the common fuel at the country—on which the little creatures could sail across the river to gnaw the enemies' bow-strings? In almost every chapter one meets with nomads or with professional

thieves, two prominent classes of Tibetans whose occupations are determined by the cold climate of the plateau, on the one hand, and the consequent poverty of the country on the other. Taken as a whole, the tales present a marked resemblance to the "Uncle Remus" stories. One meets the villainous wolf, the stupid sheep, sly fox and clever hare. There is a hint, too, of the Arabian Nights in the gryphon or roc which carries the deformed boy up to heaven to recover his fairy bride. Other stories introduce the Prince who rescues the Princess from the Ogre, and, then—in one case—to our disappointment, rides away and does not marry her. The most unique part of Capt. Connor's book is the brightly colored illustrations. They were drawn by a Tibetan artist at Gyantse. Although there is a likeness to Chinese art, they are distinctly Tibetan, and remind one of the pictures painted on the walls of Buddhist lamaseries in Ladakh and elsewhere. No one can fail to be amused and instructed by this little book which so charmingly introduces us to the Tibetan off his guard. E. H.

Parga. Von Erzherzog Ludwig Salvator. 475 pp., 42 Plates, 35 Figures in the Text, and Bibliography. H. Mercy's Son, Prague, 1907. (Not in the trade.) Presented by the Archduke Ludwig Salvator.

A sumptuous folio which the Archduke Ludwig Salvator of Austria has added to his other important contributions to the geography and history of the coasts and islands of the Mediterranean. Parga, a small port of Albania, is little known to the world at this time, but it was famous for its fidelity to the Republic of Venice for 400 years from the dawn of the fifteenth century and for the stout resistance it made to the Turks early in the nineteenth century.

It stands on a wonderfully picturesque coast not far from the island of Corfu, remote from most impulses of modern civilization, and where the very sea edge is mountainous. Its ancient citadel crowning the cliff, the Moslem quarter with its mosque, the steep shore front, and the mountains that isolate it from the rest of the Balkan peninsula make the town and its environments an especially fine subject for artistic illustration. No praise is too great for the splendid photographs and aquarelles with which the Archduke has embellished his costly volume.

He describes the town and the region it dominates in 120 pages of German text, and the remaining 355 pp., in Italian, are given to the reproduction of records and other material, which throw much light on Parga's history from 1386 to 1806. Under the domination of the Turks the population has declined from 5,000 to 2,500. The volume is a contribution to our geographical knowledge of this region and in its mechanical and artistic features it is perhaps the finest work yet devoted to any part of the Mediterranean littoral.

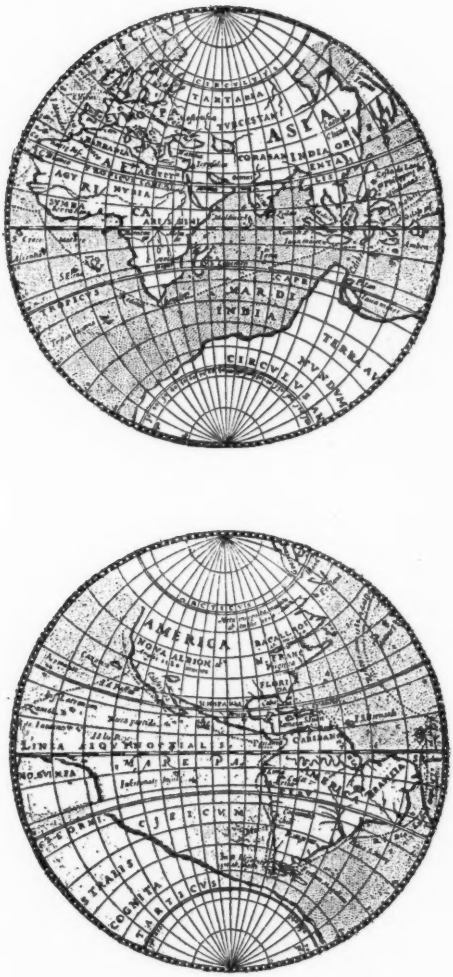
On the first page of this monumental work are the following lines, quoted from Byron's "Don Juan" (The Isles of Greece):

> "Fill high the bowl with Jonian wine!
> On Suli's rock, and Parga's shore
> Exists the remnant of a line
> Such as the Doric mothers bore;
> And there, perhaps, some seed is sown
> The Heracleidan blood might own."

Byron wrote:

> "Fill high the bowl with Samian wine!"

Does the Archduke think he is at liberty to change Byron's verse? We do no know who will agree with him, though it must be confessed that his amendment would have looked less unhappy if it had been printed Ionian, instead of Jonian.



THE SILVER MAP.

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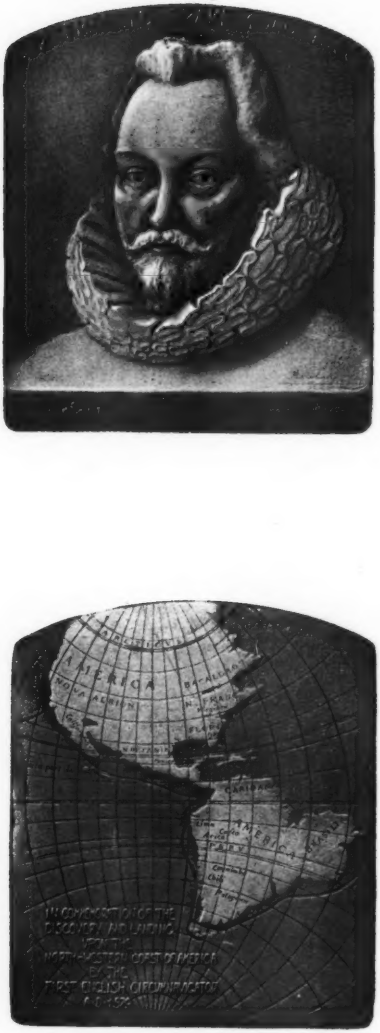

Drake Medal of the American Numismatic Society.